This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

Boston Transit Commission

Twentieth Annual Report

June 30, 1914

Eng 865.1

Harvard College Library

FROM

The Commission

TWENTIETH ANNUAL REPORT

OF THE

BOSTON TRANSIT COMMISSION,

FOR THE YEAR ENDING

JUNE 30, 1914

CITY OF BOSTON
PRINTING DEPARTMENT
1914

[illegible] 865.1

HARVARD COLLEGE LIBRARY
APR 8 1915
CAMBRIDGE, MASS.

ALLIED PRINTING
TRADES UNION LABEL COUNCIL
BOSTON MASS

LIBRARY

BOSTON TRANSIT COMMISSION.

15 Beacon Street, Boston, June 30, 1914.

To the City Council of the City of Boston:

In compliance with Statutes of 1894, chapter 548, section 24, the Boston Transit Commission respectfully submits its report for the year ending June 30, 1914.

Boylston Street Subway.

Work on the Boylston street subway has so far progressed that it is expected that by the end of the summer season it can be used as far as Park square, at which point connection is to be made with the present Tremont street subway. Details of the progress of the work will be found in the report of the Chief Engineer.

The work opposite the Old South Church was successfully completed without any disturbance of the tower of the church, which has for a long time considerably deflected from the perpendicular. The plan outlined in the last annual report was followed and, if anything, the tower and its foundations are in more stable condition than before the work was begun.

Northerly Terminal.

In the last report of the Commission reference was made to chapter 810 of the Acts of 1913, which required the Commission to report to the next General Court "whether or not, in view of the traffic to be served and the additional expense involved, it is desirable to alter the route of the Boylston street subway, as defined in chapter seven hundred and forty-one of the acts of the year nineteen hundred and eleven, by abandoning the construction of that part of the Boylston street subway between Boylston street and Park street, in the city of Boston, and in place thereof extending said subway through Boylston street to Washington street, and from Washington street by some route to Post Office square." In case the Commission should be of the opinion that such alteration were desirable it was requested to state in its report the precise route which it would recommend and the additional expense involved and to submit a draft of a bill embodying such legislation as may be necessary. Until this report should be made and acted upon by the General Court the Transit Commission was required to suspend the construction of that part of the Boylston street subway between Boylston street and Park street, and to connect said subway with the tracks of the old Tremont street subway. The Commission was also authorized to make such modifications in the contract with the Boston Elevated Railway Company for the use of the Boylston street subway as might be rendered necessary by the provisions of the Act. The Act was not to take effect until accepted by vote of the City Council of the City of Boston, approved by the Mayor, and accepted by the Boston Elevated Railway Company and the West End Street Railway Company.

This Act was duly approved and accepted and in accordance therewith the Commission submitted to the Legislature of 1914 a report embodying its conclusions and recommendation. These conclusions briefly stated were as follows:

1. It is not desirable that the only terminus of the Boylston street subway should be some point such as Post Office square nearer the business center of the city than Park street.

2. If chapter 741 of the Acts of 1911, which provides for making Park street the only terminal of the Boylston street subway, is to be amended, it should only be amended in such a way as would permit the subway to be forked, some cars running to Park street and others to some terminus farther east.

3. The cost of a double terminal would be large and in view of the fact that by going to Park street and transferring to the Dorchester tunnel passengers will be able to reach Dewey square and the corner of Summer and Chauncy streets, it is questionable at the present time whether under all circumstances the additional expense of extending the tunnel to Post Office square or some similar point would be justified.

4. The permanent terminal or termini of the Boylston street subway should not be fixed at the present time but experience should be awaited regarding the effect of the opening of the Dorchester tunnel for traffic to the South Station.

5. In the meantime the Park street station should be enlarged as authorized by the Dorchester tunnel act, chapter 741, Acts of 1911, in a manner consistent, if possible, with any decision which may be reached as to the permanent terminal or termini of the Boylston street subway.

The report of the Commission on Chapter 810 will be found as Appendix A of this report.

No action was taken by the Legislature upon this report. The whole matter of the change of route of the Boylston street subway is, therefore, in the hands of the Legislature awaiting experience regarding the effect of the opening of the Dorchester tunnel, which it is hoped will be opened for traffic to the South Station in the summer of 1915.

Boylston Street Widening.

Chapter 810 of the Acts of 1913 authorized a rearrangement of the subway entrance in the Public Garden. The change authorized involved transfer of the incline southerly to the center of Boylston street and the widening of Boylston street on the north by taking a strip of the Public Garden 40 feet wide extending from Charles street parallel to the old line as far as the westerly side of Church street and thence in a straight line to the old corner of Arlington street. Work on this portion of the scheme has been carried nearly to completion. It has been suggested that a more satisfactory and artistic result would be reached if the widening of Boylston street were continued parallel to its old line the entire distance from Charles street to Arlington street.

This Commission, however, has no authority to make any widening beyond that contemplated by the Act, so that if carried out it must be by order of the Department of Public Works or the Park and Recreation Department.

In connection with the completion of the Boylston street subway to a temporary connection with the old Subway near Park street the necessary modifications of the lease of the Boylston street subway to the Boston Elevated Railway Company have been agreed upon and executed by that Company and the Commission acting in behalf of the City of Boston. This modification will be found in Appendix B.

Miscellaneous.

The trustees of the Boston Public Library approved plans for an entrance to the Boylston street subway partly within the grounds occupied by the Public Library, and the same has been constructed by the Hecla-Winslow Company under supervision of Fox & Gale, architects. The same firm is preparing plans for an entrance from Dartmouth street.

The Police Station and Stable of Station 16, portions of which were taken or interfered with in the construction near the Massachusetts avenue station, have been remodeled by the Commission. The plans for the work and the work itself have received the approval of the Police Department. The remodeled structure was occupied by that department about February, 1914.

DORCHESTER TUNNEL.

The work upon this tunnel is being prosecuted as rapidly as practicable. During the year Sections A and B have been nearly completed and a contract has been made with the James J. Coughlan Company for the construction of Section C extending from near Chauncy street to within a short distance of Dewey square. Much work has been done in preparation of the plans for Section D, which will comprise the station at Dewey square. Many studies have been made and conferences have been held with the Boston Elevated Railway Company with relation to the details of this station and its entrances and exits. Owing to the fact that just beyond this station the subway will descend and pass under Fort Point Channel the station itself will be a deep one with two levels, one at the track level and a lobby above it. The platform of the main lower station will be about 44 feet below the surface.

This section will be constructed so as to include a sufficient distance beyond the station proper to allow trains to be carried beyond and switched back, so that the station may be used as a terminal before the completion of the entire tunnel to Dorchester.

January 27, 1914, the estate at the corner of Summer and Chauncy streets was taken for an exit and entrance for the Washington station. Contracts have been made for escalators there with the Otis Elevator Company.

In connection with the construction of the Dorchester tunnel, much consideration has been given to the enlargement of the Park street station of the Tremont street subway. Many plans have been studied and at the date of this report the Commission has under consideration one which it seems probable will meet with the approval of the Boston Elevated Railway Company and will be carried out. The proposed plan will be consistent with any construction consequent upon the determination of the terminus or termini of the Boylston street subway, wherever that or those may be located, and if this plan is adopted work will be begun early in the summer and pushed rapidly to completion.

EAST BOSTON TUNNEL EXTENSION.

The work on the extension of the East Boston tunnel has been rapidly pushed and at the date of this report it is almost all under construction. Contracts have been awarded to Coleman Bros. for the construction of Section J, extending from Staniford street to North Russell street, including the incline in Cambridge street, and for Section H, extending from Stoddard street to Staniford street, including the Bowdoin square station. As mentioned in the last annual report the work in Scollay square and as far west as Stoddard street, being of a peculiarly difficult and uncertain character, so that the work to be done could not be foreseen and adequately covered by plans and specifications, it has been done by Isaac Blair & Co., Inc., under a contract at actual cost plus 10 per cent. It is expected that all of this work will be completed during the coming year. The terminus of the East Boston tunnel will, within a short time of the date of this report, be transferred from Scollay square to Devonshire street, in order to allow the underpinning of that portion of the existing subway between Washington street and Scollay square, which will complete the entire extension.

REAL ESTATE.

In the fall of 1913, negotiations were begun by Mr. George A. Carpenter for the purchase of the property at the southwest corner of Washington and Winter streets, taken by the Commission for an entrance and exit from the Winter station, Washington street tunnel. These negotiations progressed so far that in October an agreement of sale was concluded between Mr. Carpenter and the Commission, Mr. Carpenter agreeing to pay $587,500 for the property under certain conditions. This agreement will be found in Appendix C. The terms named in the agreement were carried out April 7, 1914, and on that date the property passed to Mr. Carpenter's possession.

Many settlements of easements taken for various departments of work of the Commission have been made. These include

WASHINGTON STREET TUNNEL.

241–3 Washington street,	Samuel W. Bridgham and others.
710–721 " "	New England Trust Company.
732–734 " "	Charles E. Cotting *et al.*
9–11 " "	Hales W. Suter *et als.*, Trustees.
77–91 " "	Francis C. Welch and Charles Francis Adams, 2nd, Trustees.
95–121 " "	Fifty Associates.
125–129 " "	" "
108–128 " "	" "
130–140 " "	Frederick R. Sears *et als.*
154–164 " "	Charles E. Cotting *et als.*, Trustees Boston Real Estate Trust.
204 " "	Francis Peabody, Jr., *et als.*, Trustees.
236–244 " "	David and Henry F. Sears.
246–248 " "	Globe Newspaper Co.
283 " "	George B. Inches *et als.* and Wm. S. Dexter *et als.*, Trustees
295–297 " "	Geo. B. Inches *et als.*, Trustees.
315–319 "	Charles E. Cotting *et als.*, Trustees, Snow Associates.
364 " "	Elsie Dexter *et als.*
365 " "	Hugh M. Nelson.
442–456 " "	Francis C. Welch *et als.*, Trustees.
542–544 " "	Harry H. Thorndike *et als.*, Trustees.
590–622 " "	Charles E. Cotting *et als.*, Trustees.
836–842 " "	Francis C. Welch *et als.*, Trustees.
4–6 Dock square..........	Francis I. Amory *et als.*, Trustees.
32 Ash street.............	John R. Perry *et als.*, Trustees.

CAMBRIDGE CONNECTION.

1 Joy street.............	Episcopal Church Association.
3 " "	Twentieth Century Club.
4 " "	Joseph Lee.
86 Myrtle street..........	Jessie S. Raymond.
87 " "	Marion L. Swasey.
31 Beacon street..........	William Endicott.
32 " "	Mass. Society for Prevention of Cruelty to Animals.
69 Mt. Vernon street...	Annie L. Woods.
59 " " "	Mary E. Aldrich.
63–67 " " "	Henry N. Sweet, Tr.
40 Pinckney street.........	Ellen R. Forrestall.
35–7 Anderson street.......	Solomon Leavitt.

DORCHESTER TUNNEL.

51–53 Summer street.......	Moses and Charles A. Williams.

BOYLSTON STREET SUBWAY.

City Yard..................	City of Boston.

EAST BOSTON TUNNEL EXTENSION.

113 Cambridge street.......	Joseph Morrill *et als.*
145–51 " "	Joseph Simonds.
153–57 " "	Carrie A. Thorndike.

MISCELLANEOUS.

Reference was made in the last two reports and in the one previous to that to correspondence between His Honor the Mayor and the Commission in relation to reduction in size of the stairway coverings in Tremont street for the Cambridge Connection. Since the last report these coverings have been altered and reduced in size to conform to the expressed ideas of the Mayor.

A bronze tablet has been erected in the Park street station of the Cambridge Connection, bearing the inscription on page 10.

THE TUNNEL AND SUBWAY ROUTE TO CAMBRIDGE
AUTHORIZED BY THE LEGISLATURE — 1906
CURTIS GUILD, JR.— GOVERNOR

THIS STATION
AND THE TUNNEL UNDER BEACON HILL
BUILT BY THE
BOSTON TRANSIT COMMISSION
GEORGE G. CROCKER — CHAIRMAN
GEORGE F. SWAIN THOMAS J. GARGAN
HORACE G. ALLEN JOSIAH QUINCY
JAMES B. NOYES
THOMAS J. GARGAN DIED JULY 31, 1908.
HOWARD A. CARSON — CHIEF ENGINEER, 1906 to 1909
EDMUND S. DAVIS—ACTING AND CHIEF ENGINEER,
1909

THE PORTION IN CAMBRIDGE
AND THE ELEVATED STRUCTURE IN BOSTON BUILT
AND PART OF THE COST OF THE NEW BRIDGE
CONTRIBUTED BY THE
BOSTON ELEVATED RAILWAY COMPANY
WILLIAM A. BANCROFT — PRESIDENT
CHARLES S. SERGEANT — VICE PRESIDENT
GEORGE A. KIMBALL — CHIEF ENGINEER

OPENED MARCH 23, 1912
EUGENE N. FOSS — GOVERNOR
JOHN F. FITZGERALD — MAYOR OF BOSTON
J. EDWARD BARRY — MAYOR OF CAMBRIDGE

The Commission has erected a steel fabricating shop at its yard in South Boston, well equipped with machinery by which a considerable saving will be effected in the cost of certain portions of the steel members used in its various works.

In October, 1913, the City Council made an inquiry of the Commission as to the cost of extending the Washington street tunnel to Grove Hall and Mattapan and as to the operation of said tunnel by the city. Replies to these questions will be found in Appendix D.

LEGISLATION.

The Legislature of 1913 passed a number of resolves asking for reports from this Commission either singly or in conjunction with the Public Service Commission. These matters will be briefly referred to.

Chapter 69, Resolves of 1913, required the Commission to investigate the desirability and practicability and to estimate the cost of constructing a station of the Washington street tunnel at or near Bennet street. In compliance with this Resolve the Commission made the necessary investigations and submitted a report (House Doc. No. 164, 1914), in which a conclusion was reached that while it was physically practicable to construct such a station it was not desirable and the Commission did not recommend it. This Resolve and the report of the Commission will be found in Appendix E.

Chapter 78, Resolves of 1913, required the Commission to estimate the cost of constructing a double-track tunnel and subway for the use of trolley cars between Boston and Chelsea. In response to this Resolve the Commission made the necessary investigations and estimates and reported to the Legislature (House Doc. No. 1406, 1914), discussing various routes and giving estimates of cost of the same. This Resolve and the report of the Commission thereon will be found in Appendix F.

Chapter 84, Resolves of 1913, directed the Commission to report on certain bills providing for the removal of the elevated structure on Washington street in Boston and on Main street in Charlestown, substituting therefor a subway. In response to this Resolve the Transit Commission gave hearings and made somewhat elaborate investigations, the details of which, with the conclusions of the Commission, were submitted to the Legislature (House Doc. No. 2116, 1914). The Commission estimated that to substitute subways for elevated lines within the points specified in the Resolve would cost the City approximately $13,232,500, which expenditure would not increase the transit facilities, and would have to be assumed by the City. This Resolve and the report thereon will be found in Appendix G.

Chapter 93, Resolves of 1913, directed the Commission to investigate the advisability and to estimate the cost of constructing a subway between the Dorchester tunnel and the South Terminal Station in Boston. The Commission reported (House Doc. No. 163, 1914) that the plans for the construction of the Dorchester tunnel provided for a physical connection with the South Station by passageways leading to some points either within or directly in front of the said South Station. This Resolve and the report of the Commission will be found in Appendix H.

Chapter 108, Resolves of 1913, provided for an investigation of the service of the street railway companies to be made by the Board of Railroad Commissioners and the Boston Transit Commission, sitting as a Joint Board. This subject opened a large field for investigation. Many public hearings were held and detailed investigations made with reference to the subject matter of the Resolve, and the results were submitted in a report to the Legislature with numerous appendices (Senate Documents Nos. 448 and 474, 1914). The Resolve with the report of the Joint Commission will be found in Appendix I.

Chapter 775, Acts of 1913, provided for the construction of an additional subway in the City of Boston, this subway to replace the elevated structure in Charlestown. This subway was to be begun "at any time after the acceptance of this Act by the voters of the City of Boston voting thereon at the next city election and if the Company by its directors consents." The Boston Elevated Railway Company by its directors did not consent to the construction of said subway, and the Commission has therefore taken no action under the Act.

The House of Representatives also by an order dated March 10, 1914, requested certain information relating to the work of the Commission. This information was transmitted to the House (House Doc. No. 2325, 1914) under date of March 17, 1914. The order and the reports of the Commission will be found in Appendix J.

TERM OF THE COMMISSION.

On August 15, 1913, Mr. David A. Ellis was appointed a member of the Commission to fill the vacancy caused by the death of George G. Crocker.

The term of office of the Commission and its members was extended for three years from July 1, 1914, by Chapter 644, Acts of 1914, which will be found in Appendix K.

EAST BOSTON TUNNEL.

Toll Receipts.

The following is a statement of the receipts from tolls and the cost of collection of the same for the year ending June 30, 1914:

July 1, 1913, to July 31, 1913:		
Receipts	$13,277 90	
Cost	2,204 69	
		$11,073 21
August 1, 1913, to October 31, 1913:		
Receipts	$41,918 86	
Cost	6,612 94	
		35,305 92
November 1, 1913, to January 31, 1914:		
Receipts	$44,656 28	
Cost	6,065 38	
		38,590 90
February 1, 1914, to April 30, 1914:		
Receipts	$42,584 19	
Cost	5,862 04	
		36,722 15
May 1, 1914, to June 30, 1914:		
Receipts	$29,534 50	
Cost	3,977 22	
		25,557 28
		$147,249 46

SINKING FUND.

The following is the condition of the debt and of the sinking funds for the various divisions of the work of the Commission at the date of this report, as stated by the City Treasurer:

SUBWAY (INCLUDING ALTERATIONS).

(*Debt*, $4,416,000, *outside debt limit.*)

Amount of fund, July 1, 1913		$1,521,022 61
Interest on bank deposits, July 1, 1913, to date	$847 05	
Interest on investments, July 1, 1913, to date	54,954 16	
Revenue, etc., July 1, 1913, to date	34,948 00	
		90,749 21
		$1,611,771 82

CHARLESTOWN BRIDGE, NO. 1.

(*Debt, $750,000, inside debt limit.*)

Amount of fund, July 1, 1913		$218,310 91
Interest on bank deposits, July 1, 1913, to date	$1,008 86	
Interest on investments, July 1, 1913, to date	6,912 71	
Requirement for debt	7,669 00	
		15,590 57
		$233,901 48

CHARLESTOWN BRIDGE, NO. 2.

(*Debt, $805,000, outside debt limit.*)

Amount of fund, July 1, 1913		$251,936 89
Interest on bank deposits, July 1, 1913, to date	$1,590 02	
Interest on investments, July 1, 1913, to date	6,928 92	
Revenue, etc., July 1, 1913, to date	1,370 42	
Requirement for debt	5,747 00	
		15,636 36
		$267,573 25

EAST BOSTON TUNNEL.

(*Debt, $3,243,000, outside debt limit.*)

Amount of fund, July 1, 1913		$567,136 09
Interest on bank deposits, July 1, 1913, to date	$2,195 67	
Interest on investments, July 1, 1913, to date	18,029 90	
Revenue, etc., July 1, 1913, to date	94,330 52	
Appreciation of investments	315 00	
		114,871 09
		$682,007 18
(Paid) Interest on investments purchased		1,573 33
		$680,433 85

BOSTON TUNNEL AND SUBWAY.

(Washington Street Tunnel.)

(*Debt, $8,472,700, outside debt limit.*)

Amount of fund, July 1, 1913		$708,745 61
Interest on bank deposits, July 1, 1913, to date	$975 57	
Interest on investments, July 1, 1913, to date	25,189 30	
Revenue, etc., July 1, 1913, to date	59,993 14	
Appreciation of investments	25 00	
		86,183 01
		$794,928 62
(Paid) Interest on investments purchased		622 22
		$794,306 40

RAPID TRANSIT—CAMBRIDGE CONNECTION.

(*Debt, $1,450,000, outside debt limit.*)

Amount of fund, July 1, 1913		$42,861 00
Interest on bank deposits, July 1, 1913, to date	$182 66	
Interest on investments, July 1, 1913, to date	1,465 63	
Revenue, etc., July 1, 1913, to date	13,356 82	
		15,005 11
		$57,866 17

BOYLSTON STREET SUBWAY.

(Formerly Riverbank Subway.)

(Debt, $4,305,000, outside debt limit.)

Amount of fund, July 1, 1913		$1,452 29
Interest on bank deposits, July 1, 1913, to date	$12 99	
Interest on investments, July 1, 1913, to date	35 00	
		47 99
		$1,500 28

DORCHESTER TUNNEL.

(Debt, $1,750,000, outside debt limit.)

EAST BOSTON TUNNEL EXTENSION.

(Debt, $1,050,000, outside debt limit.)

RENTALS PAID BY THE BOSTON ELEVATED RAILWAY COMPANY.

The following is a statement of the bills rendered for rental of the various tunnels and subways and the amounts paid thereon:

TREMONT STREET SUBWAY.

Sept. 30, 1913:		
Net cost of subway	$4,100,955 72	
One quarter's rental		$49,980 40
Alterations: net cost	242,673 93	
One quarter's rental		2,957 59
Dec. 31, 1913:		
Net cost of subway	4,100,955 72	
One quarter's rental		49,980 40
Alterations: net cost	242,673 93	
One quarter's rental		2,957 59
March 31, 1914:		
Net cost of subway	4,100,955 72	
One quarter's rental		49,980 40
Alterations: net cost	242,673 93	
One quarter's rental		2,957 59
June 30, 1914:		
Net cost of subway	4,100,955 72	
One quarter's rental		49,980 40
Alterations: net cost	242,673 93	
One quarter's rental		2,957 59
		$211,751 96

WASHINGTON STREET TUNNEL.

		BILLS RENDERED.	PAID.
			*$88,544 89
Sept. 30, 1913:			
Net cost of tunnel	$7,833,679 94		
Rental for one quarter		$88,128 90	88,128 90
Dec. 31, 1913:			
Net cost of tunnel	7,887,157 81		
Rental for one quarter		88,730 53	88,730 53
Carried forward		$176,859 43	$265,404 32

---

* Paid on account of quarter ending June 30, 1913.

Brought forward		$176,859 43	$265,404 32
March 31, 1914:			
Net cost of tunnel	$7,904,471 32		
Rental for one quarter		88,925 30	88,925 30
June 30, 1914:			
Net cost of tunnel	7,895,138 56		
Rental for one quarter		88,820 31	**
Total		$354,605 04	$354,329 62

Cambridge Connection.

Sept. 30, 1913:		
Net cost of connection	$1,430,355 77	
One quarter's rental		$17,432 46
Dec. 31, 1913:		
Net cost of connection	1,436,885 78	
One quarter's rental		17,512 05
March 31, 1914:		
Net cost of connection	1,439,224 71	
One quarter's rental		17,540 55
June 30, 1914:		
Net cost of connection	1,446,930 32	
One quarter's rental		17,634 46
Total		$70,119 52

STATEMENT OF EXPENSES.

The following is a classified statement of the expenses of the Commission for the year ending June 30, 1914:

EAST BOSTON TUNNEL.

Engineering Department.

Office supplies	$0 48	
Skilled service	526 42	
Stenographers	2 40	
		$529 30

Section B.

Construction	$328 70	
Field supplies	142 63	
Labor	3,330 22	
Legal and expert advice	550 00	
Office supplies	32 82	
Skilled service	265 46	
Teaming	22 60	
		4,672 43

Section E.

Field supplies	$100 00	100 00

BOSTON TUNNEL AND SUBWAY.

Engineering Department.

Messengers	$13 50	
Skilled service	328 74	
		342 24
Carried forward		$5,643 97

** Payment for this quarter had not been made at the date of this report ($88,820.31).

Brought forward			$5,643 97

SECTION ONE.

Damages		$200 00	
Legal and expert advice		150 00	
Property Damages: Takings		55,196 85	
Skilled service		187 00	
			55,733 85

SECTION THREE.

Damages		$200 00	
Essex street entrance		567 75	
			767 75
			$62,145 57

SECTION FOUR.

Alterations		$1,612 26	
Damages		250 00	
Legal and expert advice		400 00	
Property Damages: Takings		5,875 00	
Stationery—supplies		50	
Temple place entrance		42 00	
		$8,179 76	
Credit: Property Damages: Takings, cash received for sale of property at 443 Washington street		597,070 22	588,890 46
Decrease			$526,744 89

SECTION FIVE.

Damages		$1,500 00	
Property Damages: Takings		3,500 00	
Skilled service		124 00	
		$5,124 00	

SECTION SIX.

Damages	$100 00	100 00	

SECTION SEVEN.

Field supplies	$15 00		
Legal and expert advice	175 00		
Stationery—supplies	49		
		190 49	

SECTION EIGHT.

Damages	$900 00	900 00	

SECTION NINE.

Damages	$200 00		
Skilled service	8 00		
		208 00	
			6,522 49
Carried forward (decrease)			$520,222 40

Brought forward (decrease)			$520,222 40

CAMBRIDGE CONNECTION.

ENGINEERING DEPARTMENT.

Skilled service	$158 07		
Stenographers	15 90		
Testing	24 25		
		$198 22	

SECTION ONE.

Damages	$443 07		
Legal and expert advice	150 00		
Property Damages: Takings	19,372 39		
		19,965 46	

SECTION TWO.

Builders Iron and Steel Company (Contract 465)	$2,972 00		
Construction	10 32		
Damages	273 82		
Field supplies	2 21		
Labor	5 20		
Legal and expert advice	472 24		
Lighting	240 98		
Teaming	1 50		
Tools	5 58		
		3,983 85	

DORCHESTER TUNNEL.

Office Expenses:			
Proportion of general expenses transferred from Boylston street subway	$14,260 27		
Furniture	25 67		
		14,285 94	
Engineering Expenses:			
Advertising	$51 54		
Borings:			
Labor	1,056 89		
Material	26 15		
Chief Engineer	3,218 75		
Clerks	1,417 58		
Field supplies	2,754 20		
Fuel	148 20		
Furniture	52 52		
Inspection	269 75		
Instruments	177 38		
Labor	1,546 89		
Legal and expert advice	1,125 00		
Lighting	264 09		
Messengers	363 78		
Park street enlargement	9 05		
Paving	193 00		
Printing	336 99		
Rental	2,333 32		
Repairs	1 20		
Skilled service	31,683 76		
Stationery—supplies	1,256 80		
Stenographers	1,377 01		
Stock	46,471 68		38,433 47
Carried forward	$96,135 53		$481,788 93

Brought forward	$96,135 53		$481,788 93
Teaming	162 82		
Telephone—telegraph	163 13		
Test pits	8,627 13		
Testing	395 52		
Tools	3,715 76		
Water pipes	25 00		
		$109,224 89	

SECTION A.

(*From the end of the Cambridge Connection at the east line of Tremont street, under Winter street to about the west line of Washington street.*)

Coughlan & Sheils Co. (Contract 433)	$40,338 00		
Boston Bridge Works (Contract 445)	346 44		
Coleman Brothers (Contract 468—Paving)	3,923 15		
Hugh Nawn Contracting Co. (Contract 483)	12,622 11		
Advertising	6 10		
Alterations	897 99		
Construction	5,102 55		
Damages	11,879 82		
Field supplies	33 46		
Fuel	1 38		
Labor	951 50		
Lighting	824 33		
Paving	20 55		
Skilled service	774 09		
Stationery—supplies	12 80		
Teaming	16 89		
Tools	132 42		
Water pipes	170 19		
		78,053 77	

SECTION B.

(*From about the west line of Washington street, under Washington and Summer streets, to a point about 50 feet east of the east line of Arch street.*)

Hugh Nawn Contracting Co. (Contract 457)	$293,829 32		
Bethlehem Steel Co. (Contract 443)	1,332 24		
Boston Bridge Works (Contract 445)	12,447 99		
Bethlehem Steel Co. (Contract 449)	1,188 00		
Hugh Nawn Contracting Co (Contract 483)	150 10		
Alterations	1,493 04		
Construction	54,483 56		
Damages	612 10		
Field supplies	612 10		
Fuel	4 90		
Inspection	1,457 00		
Instruments	29 80		
Insurance	3,384 65		187,278 66
Carried forward	$371,024 80		$294,510 27

Brought forward	$371,024 80	$294,510 27
Labor	14,880 62	
Legal and expert advice	879 70	
Lighting	426 16	
Paving	1,657 23	
Property Damages: Takings	380,000 00	
Rental	385 00	
Skilled service	5,729 64	
Stationery—supplies	237 65	
Teaming	96 69	
Telephone—telegraph	109 80	
Testing	15 35	
Tools	288 18	
Water pipes	2,612 81	
		778,343 63
Balance (increase)		$483,833 36

SECTION C.

(Located in Summer street and extends from near Arch street to Dewey square, a distance of about 1,018 linear feet.)

James J. Coughlan Co. (Contract 485)	$94,390 27	
Advertising	39 04	
Alterations	39 12	
Borings:		
Labor	71 79	
Construction	18,790 67	
Field supplies	206 60	
Furniture	14 50	
Inspection	15 10	
Instruments	15 60	
Insurance	237 00	
Labor	6,580 30	
Lighting	267 10	
Paving	42 70	
Printing	168 25	
Rental	375 00	
Skilled service	2,600 07	
Stationery—supplies	43 69	
Teaming	46 38	
Telephone—telegraph	52 16	
Testing	11 82	
Tools	97 10	
Water pipes	133 27	
		124,228 53

SECTION D.

(Located in Dewey square and Summer street and has a length of about 800 linear feet. It includes a two-platform station with a lobby over the tracks, a pump well, elevator shafts and stairways.)

Skilled service	$1 40	1 40

BOYLSTON STREET SUBWAY.

Office Expenses:		
Furniture	$44 91	
Lighting	75 24	
Printing	424 05	
Rental	3,000 00	
Carried forward	$3,544 20	$608,063 29

Brought forward		$3,544 20	$608,063 29
Stationery—supplies		1,164 56	
Telephone—telegraph		979 56	
Stenographers		5,176 72	
Messenger		1,196 52	
Salaries of Commissioners and Secretary		27,888 89	
		$39,950 45	
Transferred to Dorchester Tunnel,	$14,260 27		
Transferred to East Boston Tunnel Extension	8,599 42		
		22,859 69	
			17,090 76
Engineering Expenses:			
Advertising		$3 65	
Chief Engineer		3,875 00	
Clerks		1,241 99	
Field supplies		1,137 16	
Fuel		68 70	
Furniture		68 50	
Inspection		75 35	
Instruments		218 32	
Labor		262 63	
Legal and expert advice		900 00	
Lighting		651 67	
Messengers		264 06	
Paving		186 50	
Printing		1,937 49	
Rental		4,166 68	
Skilled service		31,415 04	
Stationery—supplies		1,542 69	
Stenographers		2,256 88	
Teaming		52 00	
Telephone—telegraph		212 88	
Testing		92 17	
Tools		3,323 03	
		$53,952 39	
Credit: Stock transferred to various sections		41,753 60	
			12,198 79

SECTION ONE.

(From the easterly side of Kenmore street through Commonwealth avenue, the Fens, and Newbury street to the middle of Massachusetts avenue.)

Hugh Nawn Contracting Company (Contract 427)	$24,037 64	
Construction	1,739 03	
Damages	580 19	
Field supplies	17 90	
Labor	2,333 81	
Legal and expert advice	120 00	
Lighting	41 36	
Paving	9 00	
Skilled service	196 99	
Stationery—supplies	47 46	
Teaming	138 87	
Tools	639 11	
Water pipes	1,132 72	
		31,034 08
Carried forward		$668,386 92

Brought forward		$668,386 92

SECTION TWO.

(From the middle of Massachusetts avenue, under private property and Boylston street, to the easterly line of Hereford street.)

Hugh Nawn Contracting Company (Contract 427)	$134,396 54	
Hugh Nawn Contracting Company (Contract 432)	6,500 00	
Hugh Nawn Contracting Company (Contract 491)	990 11	
Boston Bridge Works (Contract 445)	2,104 27	
Gleason & Berry (Contract 504)	1,385 25	
Galassi Mosaic and Tile Company (Contract 509)	609 98	
Robert Gallagher Company (Contract 510)	1,226 87	
Advertising	19 89	
Alterations	800 00	
Construction	39,565 39	
Field supplies	667 06	
Fuel	58 13	
Inspection	64 87	
Instruments	47 88	
Labor	4,708 22	
Legal and expert advice	650 00	
Lighting	134 49	
Paving	100 23	
Property Damages: Takings	429,818 75	
Skilled service	3,195 34	
Stationery—supplies	221 89	
Teaming	90 27	
Telephone—telegraph	105 46	
Testing	9 52	
Tools	45 67	
Water pipes	344 96	
	$627,861 04	
Credit: Alterations—Station 16	1,853 38	
		626,007 66

SECTION THREE.

(From the easterly line of Hereford street, under Boylston street to the westerly end of the Public Library.)

Hugh Nawn Contracting Company (Contract 432)	$16,000 00	
Hugh Nawn Contracting Company (Contract 432—Paving)	16,776 33	
Warren Brothers Company (Contract 462)	12,668 31	
Advertising	4 10	
Alterations	37 95	
Construction	1,302 82	
Labor	713 76	
Lighting	5 55	
Paving	261 41	
Skilled service	223 61	
Stationery—supplies	14 22	
Teaming	13 88	
Carried forward	$48,021 94	$1,294,394 58

Brought forward	$48,021 94	$1,294,394 58
Tools	14 50	
Water pipes	4,665 83	
		52,702 27

SECTION FOUR.

(From the westerly end of the Public Library, under Boylston street, to about the center of Arlington street.)

Hugh Nawn Contracting Company (Contract 453)	$647,797 59	
Hugh Nawn Contracting Company (Contract 491)	4,669 65	
Gleason & Berry (Contract 504)	1,602 49	
Robert Gallagher Company (Contract 510)	344 30	
Boston Bridge Works (Contract 445)	2,757 13	
Bethlehem Steel Company (Contract 449)	1,954 40	
Advertising	77 07	
Alterations	3 00	
Construction	113,946 63	
Field supplies	349 43	
Fuel	74 38	
Furniture	8 25	
Inspection	1,625 41	
Instruments	106 55	
Labor	8,927 33	
Legal and expert advice	718 50	
Lighting	415 80	
Paving	5,512 90	
Skilled service	6,643 40	
Stationery—supplies	276 96	
Teaming	71 17	
Telephone—telegraph	97 86	
Testing	49 38	
Tools	231 33	
Water pipes	10,311 51	
		808,572 42

SECTION FIVE.

(Located in Boylston street and extends from Arlington street to about 30 feet east of Carver street, a distance of about 1,050 feet.)

Hugh Nawn Contracting Company (Contract 471)	$356,933 95	
Boston Bridge Works (Contract 445)	356 31	
Bethlehem Steel Company (Contract 480)	8,017 09	
Borings:		
Material	5 05	
Construction	53,076 64	
Field supplies	84 39	
Fuel	70 05	
Furniture	33 49	
Inspection	380 65	
Instruments	1 70	
Labor	14,706 45	
Lighting	998 16	
Paving	215 00	
Printing	20 50	
Skilled service	3,751 03	
Stationery—supplies	222 30	
Teaming	77 20	
Carried forward	$438,949 96	$2,155,669 27

Brought forward	$438,949 96	$2,155,669 27
Telephone—telegraph	72 61	
Testing	127 70	
Tools	415 26	
Water pipes	232 26	
		439,797 79

EAST BOSTON TUNNEL EXTENSION.

Office Expenses:		
Stationery—supplies	$4 49	
Proportion of general expenses, transferred from Boylston street subway	8,599 42	
		8,603 91
Engineering Expenses:		
Isaac Blair & Co., Inc. (Contract 448)	$269,863 10	
Boston Bridge Works (Contract 445)	907 00	
Bethlehem Steel Co. (Contract 449)	10,515 51	
Advertising	21 41	
Alterations	88 63	
Borings:		
Labor	31 17	
Cambridge street widening	40,865 39	
Chief Engineer	1,906 25	
Clerks	1,275 12	
Construction	23,268 55	
Field supplies	5,511 90	
Fuel	184 00	
Furniture	25 31	
Inspection	314 23	
Instruments	180 92	
Labor	3,497 55	
Legal and expert advice	200 00	
Lighting	1,901 13	
Messengers	340 92	
Printing	278 12	
Rental	699 97	
Skilled service	26,969 95	
Stationery—supplies	897 26	
Stenographers	1,397 83	
Teaming	275 14	
Telephone—telegraph	159 10	
Testing	98 11	
Tools	938 65	
Water pipes	9 58	
	$392,621 80	
Credit: Stock transferred to various sections	2,142 97	
		390,478 83

SECTION G.

(*Changes in the Scollay square station and in the existing East Boston Tunnel and all new work from Washington street to Stoddard street.*)

Bethlehem Steel Co. (Contract 440)	$6,884 98	
Boston Bridge Works (Contract 445)	8,694 12	
Alterations	785 59	
Construction	37,036 09	
Damages	1,827 63	
Field supplies	10,791 47	
Fuel	1,084 87	
Furniture	1 95	
Carried forward	$67,106 70	$2,994,549 80

Brought forward	$67,106 70	$2,994,549 80
Inspection	147 51	
Instruments	55 40	
Labor	12,504 16	
Lighting	10,471 11	
Paving	117 56	
Printing	15 25	
Skilled service	1,826 22	
Stationery—supplies	87 99	
Teaming	1,079 49	
Telephone—telegraph	95 05	
Testing	180 55	
Tools	522 66	
Water pipes	318 21	
		94,527 23

SECTION H.

(*All work from Stoddard street to Staniford street and including the Bowdoin station.*)

Coleman Bros. (Contract 494)	$113,876 32	
Boston Bridge Works (Contract 445)	561 66	
Bethlehem Steel Co. (Contract 480)	157 19	
Advertising	91 72	
Alterations	370 12	
Construction	15,246 26	
Field supplies	380 52	
Fuel	30 30	
Furniture	1 50	
Inspection	138 02	
Instruments	64 22	
Labor	5,662 69	
Legal and expert advice	90 00	
Lighting	148 62	
Printing	174 50	
Skilled service	2,099 42	
Stationery—supplies	47 17	
Teaming	120 47	
Telephone—telegraph	13 00	
Testing	37 96	
Tools	342 03	
		139,653 69

SECTION J.

(*All work west of Staniford street to North Russell street.*)

Coleman Bros. (Contract 473)	$68,715 63	
Advertising	67 37	
Alterations	1,398 62	
Construction	19,410 14	
Field supplies	496 75	
Fuel	156 85	
Furniture	56 25	
Inspection	690 19	
Instruments	42 65	
Labor	4,392 57	
Legal and expert advice	276 25	
Lighting	230 18	
Paving	146 10	
Printing	202 50	
Skilled service	1,673 25	
Stationery—supplies	75 73	
Carried forward	$98,031 03	$3,228,730 72

Brought forward	$98,031 03	$3,228,730 72
Teaming	156 62	
Telephone—telegraph	76 71	
Testing	6 35	
Tools	152 41	
Water pipes	1,206 42	
		99,629 54

CHAPTER 78—RESOLVES OF 1913.

Office Expenses	$0 37	
Engineering Expenses	388 77	
		389 14

CHAPTER 84—RESOLVES OF 1913.

Office Expenses	$195 48	
Engineering Expenses	439 00	
		634 48

INTEREST.

Boylston street subway	$122,953 33	
Dorchester tunnel	72,246 66	
East Boston tunnel extension	41,206 67	
		236,406 66
Net increase		$3,565,790 54

SUMMARY.

	From beginning of work to June 30, 1913.	June 30, 1913, to June 30, 1914.	Total.
Subway — Subway Commission	$14,131 16		$14,131 16
Part of General Expenses	117,550 71		117,550 71
Engineering and miscellaneous	407,475 48		407,475 48
Section One	239,407 12		239,407 12
Two	363,605 50		363,605 50
Three	300,639 36		300,639 36
Three and one-half	9,355 70		9,355 70
Four	469,620 33		469,620 33
Five	388,955 49		388,955 49
Six	327,541 86		327,541 86
Seven	231,504 27		231,504 27
Eight	95,902 06		95,902 06
Eight and one-half	76,639 47		76,639 47
Nine	299,452 07		299,452 07
Ten	254,497 88		254,497 88
Eleven	270,310 57		270,310 57
Interest	258,575 60		258,575 60
	$4,125,164 63		$4,125,164 63
Transfer to Alterations, see 11th report	4 95		4 95
Total	$4,125,159 68		$4,125,159 68

	From beginning of work to June 30, 1913.	June 30, 1913, to June 30, 1914.	Total.
Alterations — Part of General Expenses . .	$28,945 53		$28,945 53
Section Three . . .	2,568 26		2,568 26
Four . . .	163 42		163 42
Five . . .	30,233 01		30,233 01
Seven . . .	178,516 16		178,516 16
Nine . . .	3 00		3 00
Ten . . .	534 04		534 04
Interest	1,905 56		1,905 56
Transfer from Subway, see 11th report . . .	4 95		4 95
Total	$242,873 93		$242,873 93
Charlestown Bridge:			
Total	$1,570,197 98		$1,570,197 98
Investigation of Congestion of Traffic, etc.:			
Total	$3,015 92		$3,015 92
East Boston Tunnel — Part of General Expenses	$161,134 78		$161,134 78
Engineering Expenses .	192,029 20	$529 30	192,558 50
Section A	98,869 09		98,869 09
B	1,398,385 87	4,672 43	1,403,058 30
C	508,192 77		508,192 77
D . . .	246,554 26		246,554 26
E	188,203 27	100 00	188,303 27
F	243,793 42		243,793 42
Interest	248,156 88		248,156 88
Total	$3,285,319 54	$5,301 73	$3,290,621 27
Boston Tunnel & Subway—Part of General Expenses	$226,486 57		$226,486 57
Engineering Expenses .	417,998 05	$342 24	418,340 29
Section One . . .	759,852 97	55,733 85	815,586 82
Two . . .	641,713 50		641,713 50
Three . .	683,065 15	767 75	683,832 90
Four . . .	1,786,786 16	*588,890 46	1,197,895 70
Five . . .	1,074,899 84	5,124 00	1,080,023 84
Six . . .	334,430 37	100 00	334,530 37
Seven . . .	139,466 40	190 49	139,656 89
Eight . . .	616,252 07	900 00	617,152 07
Nine . . .	678,551 91	208 00	678,759 91
Ten . . .	142,880 35		142,880 35
Eleven . .	345,493 91		345,493 91
Twelve . .	45,417 52		45,417 52
Interest	645,186 05		645,186 05
Total	$8,538,480 82	*$525,524 13	$8,012,956 69

---

* Decrease.

	From beginning of work to June 30, 1913.	June 30, 1913, to June 30, 1914.	Total.
Cambridge Connection:			
Office Expenses . .	$62,355 20		$62,355 20
Engineering Expenses .	96,950 13	$198 22	97,148 35
Section One . . .	560,628 73	19,965 46	580,594 19
Two . . .	619,409 61	3,983 85	623,393 46
Interest	76,722 00		76,722 00
	$1,416,065 67	$24,147 53	$1,440,213 20
Dorchester Tunnel:			
Office Expenses . .	$23,638 90	$14,285 94	$37,924 84
Engineering Expenses .	185,145 30	109,224 89	294,370 19
Section A	323,042 76	78,053 77	401,096 53
B	108,223 02	778,343 63	886,566 65
C	2,638 52	124,228 53	126,867 05
D		1 40	1 40
Interest	4,566 66	72,246 66	76,813 32
Total	$647,255 16	$1,176,384 82	$1,823,639 98
Boylston Street Subway:			
Office Expenses . .	$50,566 03	$17,090 76	$67,656 79
Engineering Expenses .	149,627 53	12,198 79	161,826 32
Section One . . .	690,973 01	31,034 08	722,007 09
Two . . .	211,235 03	626,007 66	837,242 69
Three . . .	523,208 47	52,702 27	575,910 74
Four . . .	398,092 90	808,572 42	1,206,665 32
Five . . .		439,797 79	439,797 79
Interest	39,030 01	122,953 33	161,983 34
Total	$2,062,732 98	$2,110,357 10	$4,173,090 08
East Boston Tunnel Extension:			
Office Expenses . .	$8,572 92	$8,603 91	$17,176 83
Engineering Expenses .	310,309 71	390,478 83	700,788 54
Section G . . .		94,527 23	94,527 23
H . . .		139,653 69	139,653 69
J		99,629 54	99,629 54
Interest	3,355 56	41,206 67	44,562 23
Total	$322,238 19	$774,099 87	$1,096,338 06
Chapter 78—Resolves of 1913:			
Office Expenses . .		$0 37	$0 37
Engineering Expenses .		388 77	388 77
Total		$389 14	$389 14
Chapter 84—Resolves of 1913:			
Office Expenses . .		$195 48	$195 48
Engineering Expenses .		439 00	439 00
Total		$634 48	$634 48

	From beginning of work to June 30, 1913.	June 30, 1913, to June 30, 1914.	Total.
Dorchester Tunnel Extension: .	$520 19		$520 19
Grand Total . . .	$22,213,860 06	$3,565,790 54	$25,779,650 60

The report of the Chief Engineer follows.

GEORGE F. SWAIN,
HORACE G. ALLEN,
JOSIAH QUINCY,
JAMES B. NOYES,
DAVID A. ELLIS,
Boston Transit Commission.

REPORT OF THE CHIEF ENGINEER.

BOSTON, June 30, 1914.

GEORGE F. SWAIN, HORACE G. ALLEN, JOSIAH QUINCY, JAMES B. NOYES, DAVID A. ELLIS, *Boston Transit Commissioners.*

GENTLEMEN:— In compliance with your instructions I beg leave to submit the following report regarding work on the Dorchester Tunnel, the Boylston-street Subway and the East Boston Tunnel Extension for the year ending June 30, 1914.

DORCHESTER TUNNEL.

SECTION B.

Construction Data.

Location and description of structures: A two-platform station with lobby above, and connections with the Washington-street Tunnel. This section extends under Summer street from Washington street to Arch street.

Plates in previous annual reports and in this report: XIX., 5 and 6; XX., 2.

Assistant Engineer in charge of construction: G. D. Emerson.

Contractor and date of contract: Hugh Nawn Contracting Company, March 31, 1913.

Amount of bid: $351,048.00.

Date of extension of contract to include entrance and exit at Chauncy street and exit at Hawley street: June 24, 1913.

Appendix in previous report showing bids: XIX., Y.

Date of completion named in contract: March 31, 1914 (will be extended on account of extension of contract).

Dates of beginning: Excavation, April 1, 1913; Concrete, April 28, 1913.

Amount of work done during year ending June 30, 1914: *Excavation, 35,845 cu. yds.; Old masonry removed, 1,979 cu. yds.; Standard concrete placed, 11,067 cu. yds.; Cinder concrete placed, 1,302 cu. yds.; Structural steel placed, 876 tons; Steel rods used for reinforcing concrete, 379 tons.

Total amount of work done to and including June 30, 1914, from beginning of work: *Excavation, 50,845 cu. yds.; Old masonry removed, 3,029 cu. yds.; Standard concrete placed, 12,367 cu. yds.; Cinder concrete placed, 2,072 cu. yds.; Structural steel placed, 896 tons; Steel rods used for reinforcing concrete, 405 tons.

---

* Including work on the elevator shafts.

Number of men ordinarily employed by the contractor during year ending June 30, 1914: Day, 160; Night, 80.

Character of earth found in excavation: Sand and clay.

Disposition of surplus earth: Some has been used for filling in South Boston and some has been delivered to scows and dumped at sea.

Contractor for building and erecting two double-file cleat type escalators and date of contract: Otis Elevator Company, November 11, 1913.

Amount of bid: $25,725.00 for both machines.

Contractors for furnishing structural steelwork and dates of contracts: Boston Bridge Works, September 30, 1912; Bethlehem Steel Company, December 12, 1912.

This station is a two-story structure with a ticket office lobby the full length of the station above, and with two platforms below. Stairways near each end will connect each platform with the lobby. One inclined ascending elevator will run from each platform to the street level. The elevator for passengers from west-bound trains will be on the easterly side of Hawley street and the elevator for passengers from east-bound trains will be on the westerly side of Chauncy street. Near the easterly end of the station a stairway will connect the lobby with Chauncy street and at the westerly end a stairway will lead to Summer street.

Transfer to south-bound Washington-street Tunnel trains can be made through passageways which lead from the west end of each platform under the Washington-street Tunnel to the Winter station platform. Transfer to north-bound Washington-street Tunnel trains can be made through the lobby, which is on the same level as the Summer station platform.

The work under the main contract for Section B, which was described in the Nineteenth Annual Report, has been practically finished at the date of this report. On June 24, 1913, the original contract of the Hugh Nawn Contracting Company was extended to include the construction of an entrance and exit at Chauncy street and the construction of two inclined elevator shafts for the elevators mentioned above, one leading to the surface in the building on the west side of Chauncy street, and the other to the surface in the building on the east side of Hawley street. The additional supporting of buildings made necessary by the extension of the contract is being done by Isaac Blair & Company, Inc., under a sub-contract. The Chauncy street sidewalk, from Summer street to the station entrance, is to be increased in width from 8 feet to 10 feet in order to better accommodate the increased travel.

Where practicable, pipes, conduits and other sub-surface structures between the roof of the tunnel and the street surface were replaced and supported on the tunnel roof before the backfilling was done, in order to avoid, as far as possible, disturbing the surface of the street after replacing the pavement.

Plate 2 shows the unfinished interior of the station at platform level.

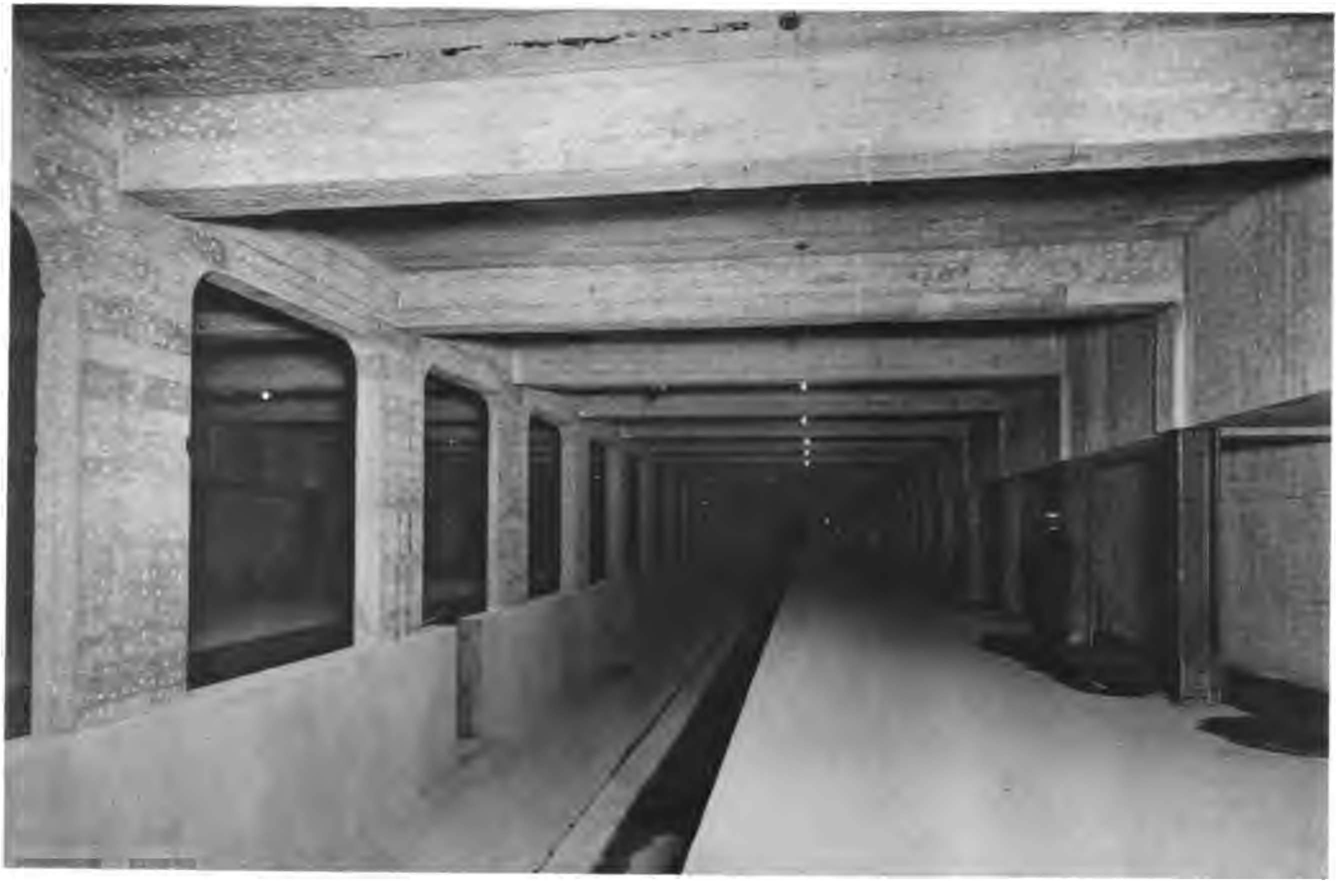
SECTION C.

Construction Data.

Location: Under Summer street from the easterly line of Arch street to the westerly side of Dewey square.
Plate in this report: 3.
Assistant Engineer in charge of construction: G. D. Emerson.
Contractor and date of contract: James J. Coughlan Company, December 20, 1913.
Amount of bid: $325,150.00.
Appendix in this report showing bids: W.
Date of completion named in contract: December 31, 1914.
Date of beginning of work: January 3, 1914.
Amount of work done during the year ending June 30, 1914: Excavation, in open cut, 11,228 cu. yds.; in tunnel, 8,514 cu. yds.; Masonry removed, 466 cu. yds.; Standard concrete placed, open cut, 2,655 cu. yds., tunnel, 2,658 cu. yds.; Cinder concrete placed, 426 cu. yds.; Steel rods used for reinforcing concrete, 222 tons.
Number of men ordinarily employed by the contractor during year ending June 30, 1914: Day, 150; Night, 80.
Character of earth: Hard clay with occasional pockets of sand.
Disposition of surplus earth: Delivered to scows and dumped at sea.

Section C is a two-track structure of reinforced concrete extending under Summer street from Arch street to Dewey square, a length of about 1,020 feet. Two hundred and seventy feet at the west end of the section is being built in open cut and has a gallery overhead between the main tube and the street. This two-story type was adopted to lessen the earth load on the tunnel roof and also to avoid an excessive depth of backfilling over the tunnel, as such deep fills greatly lengthen the time before the permanent paving can be relaid. In this portion of the work the sewers had to be entirely removed, and two new sewers, one on each side of the tunnel, were built to replace them. The work on the easterly 750 feet of the section, where the depth of the structure is great enough to give sufficient clearance below the sewers, is being done by

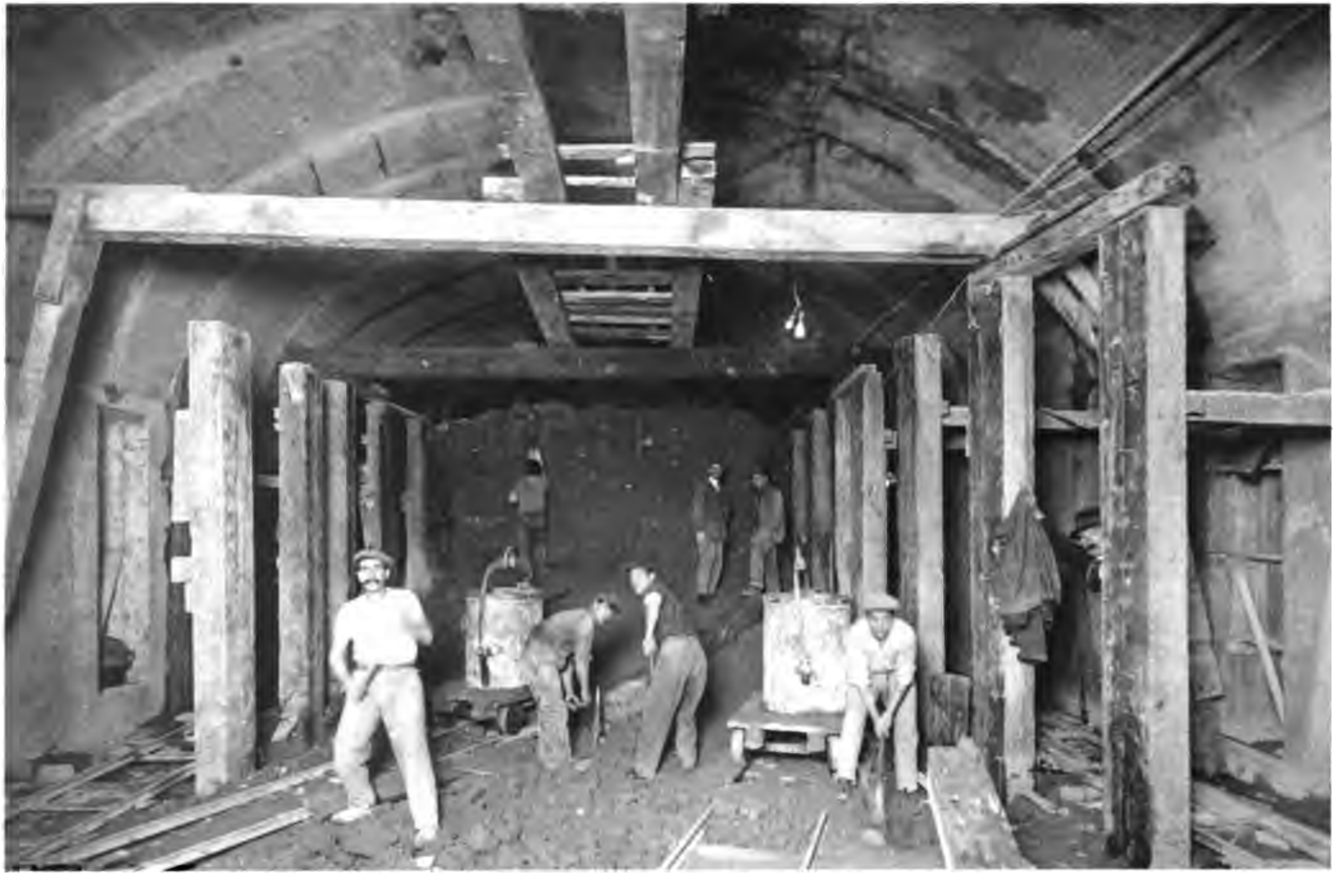
PLATE 2



HELIOTYPE CO., BOSTON

DORCHESTER TUNNEL, SECTION B, WASHINGTON STATION. NORTHERLY PLATFORM, LOOKING WESTERLY.

PLATE 3



HELIOTYPE CO., BOSTON

DORCHESTER TUNNEL, SECTION C, LOOKING EASTERLY UNDER SUMMER STREET. REMOVING THE CORE OF EARTH AFTER SIDE WALLS AND ROOF OF TUNNEL HAVE BEEN BUILT.

tunneling. For this length there is about 30 feet of earth between the roof of the tunnel and the street. The work is being prosecuted from shafts at each end and also from two intermediate shafts, one at Church Green and one at High street.

Plate 3 is an interior view showing one phase of the construction work.

ENLARGEMENT OF PARK-STREET STATION.

Studies have been made for the enlargement of Park-street station, authorized by Section 1, Chapter 741, Acts of 1911. These studies have been made to conform to any one of many plans for additional tracks at Park street which may be adopted in the future should the Boylston-street Subway be extended to this place.

At the southerly end of the Park-street station the construction of the subway is such that there are sharp reverse curves on all but the easterly track, built to avoid the destruction of several large elms, which have since died. The platforms at the southerly end of the station also are on reversed curves and are narrow, being about 4 feet in width. The studies for the enlargement of Park-street station contemplates straightening the tracks and lengthening and widening both platforms. Conforming to these studies the westerly platform will be straightened and lengthened toward the south about 118 feet and be widened so that the width will average about 22 feet. The location of the southerly entrance and exit to the westerly platform will be changed to the southerly end of the new platform and will be about 55 feet north of the northerly line of West street, if extended to the Common. The easterly platform will be straightened and lengthened about 28 feet and the narrowest part, at the southerly end, will be about 11½ feet wide. Changes in the southerly entrance and exit of this platform will be made, but the location of the building will remain the same.

BOYLSTON-STREET SUBWAY.

General Statistics.

Constructed in accordance with Chapter 741, Acts of 1911. Work on construction begun March 18, 1912. Now substantially completed with the exception of the connection with the existing subway at Carver street, near Park square, the interior finish of stations, coverings over entrances and exits and some minor details. Length from head of incline at Kenmore street to temporary connection with the Tremont-street Subway at Carver street, 7,937 feet or about 1½ miles. Length of single track, 15,870 feet. Length of curves, (400 to 5,000 feet radius) 2,506 feet or about 32 per cent. of the length of the subway. Curvature on a total deflecture, 152 degrees. Length wholly or partly under buildings, about 380 feet, between Massachusetts avenue and Hereford street. Greatest depth of bottom of structure below the surface, 39 feet. Type of structure, reinforced concrete tube; two adjoining tubes, each for one track, from foot of incline to Hereford street; one wide tube for two tracks from Hereford street to Copley station; one wide tube with center row of columns from Copley station to pump well at incline near Church street; two tubes from pump well to foot of Church street incline; one 4-track subway with interior columns from foot of incline to junction with the existing subway. Total amount of work done to and including June 30, 1914, from beginning of work: Earth excavated, 386,000 cu. yds.; Standard concrete placed, 115,610 cu. yds.; Steel rods used for reinforcement, 6,520 tons; Structural steel placed, 1,435 tons.

Assistant Engineer in charge of construction, Laurence B. Manley.

The work done during the year covered by this report has included the construction and finish of the Massachusetts and Copley stations, the completion of the subway between the Copley station and its temporary connection with the Tremont-street Subway at Carver street, and the restoration of the surface pavement over the completed work west of Exeter street.

In addition to the work done by the Boston Transit Commission, the Boston Elevated Railway Co., lessee of the subway, has installed its tracks, permanent lights and other equipment in the subway as fast as its construction has permitted.

GROUND WATER.

Observations of the level of the ground water taken on both sides of the completed subway show that the ground water, which was lowered by long-continued pumping during subway construction, has now returned to its original level.

The layer of sand and gravel, the top of which lies at a depth of about 28 feet below the surface, and which is directly below the silt forming the bottom of the old Back Bay basin, is thought to connect with the bed of the Charles River and by this means to furnish an underground water course which maintains the level of the ground water through that part of the Back Bay west of Exeter street.

Plate 4 is a profile which shows the geological formation along the line of the subway.

The amount of leakage of this ground water into the subway is small, taking into consideration the fact that 70% of the volume of the subway lies below the level of the surrounding ground water. Data on the easterly portion of the subway is not now available, but the leakage of the westerly portion, one mile in length, which is collected in the pump wells at the Fens and at Exeter street, amounts to about 15 cubic feet per hour, and requires pumping out but once a week. The seepage compares very favorably with that into other subways, and is not sufficient to affect the level of the ground water outside.

SECTION 1.

Construction Data.

Location and description of structures: Two-track subway, mainly of reinforced concrete, from Commonwealth avenue at the easterly side of Kenmore street to the center of Massachusetts avenue, Sta. 19 + 36, a distance of 1,936 feet.

Plates in previous annual reports and in this report: XVIII., 2, 7, 8 and 9; XIX., 7 and 8; XX., 5, 6 and 7.

Contractor and date of contract: Hugh Nawn Contracting Company, March 14, 1912.

Amount of bid: $532,540.00.

Appendix in previous report showing bids: XVIII., Y.

Date of completion named in contract: April 1, 1913.

Date of certificate of completion: March 17, 1913.

Dates of beginning: Excavation, March 12, 1912; Concrete, May 20, 1912.

Dates of completion: Excavation, February 1, 1913; Concrete, February 19, 1913.

Total amount of work done to and including June 30, 1914, from beginning of work: Excavation, 87,540 cu. yds.; Old masonry removed, 290 cu. yds.; Standard concrete placed, 24,824 cu. yds.; Structural steel placed, 97.91 tons; Steel rods used for reinforcing concrete, 1,067 tons.

Character of earth found in excavation: Gravel filling over a layer of silt. Below the silt is a layer of sand and gravel, carrying large quantities of water, and below this is hard blue clay.

Disposition of surplus earth: To Fenway in rear of Museum of Fine Arts, to Fenway at corner of Commonwealth avenue and Charlesgate West, and to Metropolitan Park at Cottage Farm, Allston.

Contractor for furnishing structural steelwork and date of contract: Bethlehem Steel Company, March 14, 1912.

Amount of bid: $2,887.50.

Date of completion named in contract: April 15, 1912.

Date of certificate of completion: April 23, 1912.

Contractor for building concrete balustrade around the incline near Kenmore street and date of contract: Emerson & Norris Company, April 7, 1913.

Amount of bid: $4,412.00.

Appendix in previous report showing bids: XIX., R.
Date of completion named in contract: May 15, 1913.
Date of certificate of completion: June 21, 1913.

This section was practically completed during the year ending June 30, 1913, and is described in the Nineteenth Annual Report. Plate 5 is an interior view in the southerly tube of the subway looking easterly from a point nearly under Commonwealth avenue and Charlesgate West. Plate 6 shows the relative position of the subway and the buildings on Newbury street near Charlesgate East. In order to pass under the Fens Pond and under the Stony Brook conduit, the subway had to be deeper than the pile foundations of the buildings near by. Interlocking steel sheet piling was driven on each side and excavation for the subway made between the rows of sheet piling, as described in the Nineteenth Annual Report.

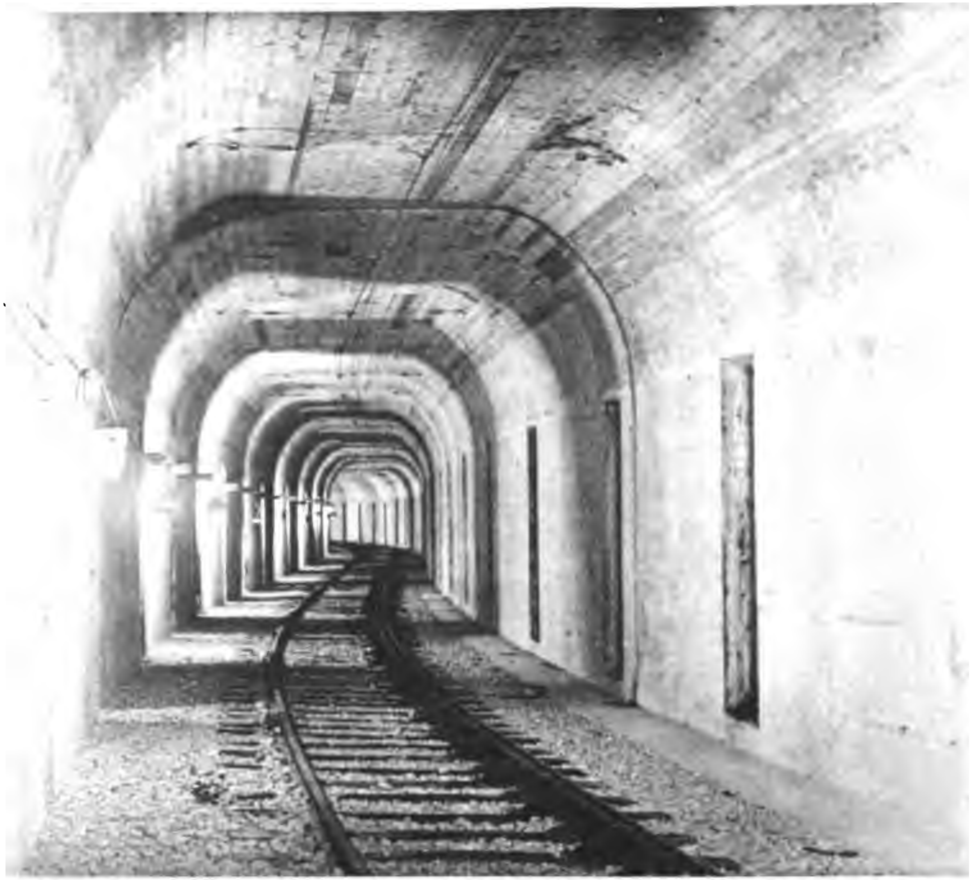
The work on this section during the past year has been the restoration of the surface of Commonwealth avenue and the Fens over and near the subway, and the construction of a ventilating chimney and building over the combined pump well chamber and emergency exit in the Fens at Charlesgate East. The pump chamber is situated at the south side of the subway, its floor being one foot above the level of the rail and the sump having a depth of 11½ feet below the floor, with a capacity of about 2,000 cubic feet. Over the roof of the subway and connected with its interior by two openings, each 2 feet 6 inches by 8 feet, is a fan chamber for the ventilation of the subway. The air is discharged through a concrete shaft and out through the building in the Fens. A winding flight of concrete stairs, 3 feet wide, for emergency exit purposes, leads from the track level and from the pump chamber to the building on the surface, and connects with the fan chamber above the tracks. The walls of the building are of buff-colored brick and the roof is covered with red Spanish roll tile. A space under the eaves 1 foot 8 inches wide around the sides of the building is left open for ventilation. See Plate 7.

SECTION 2.

Construction Data.

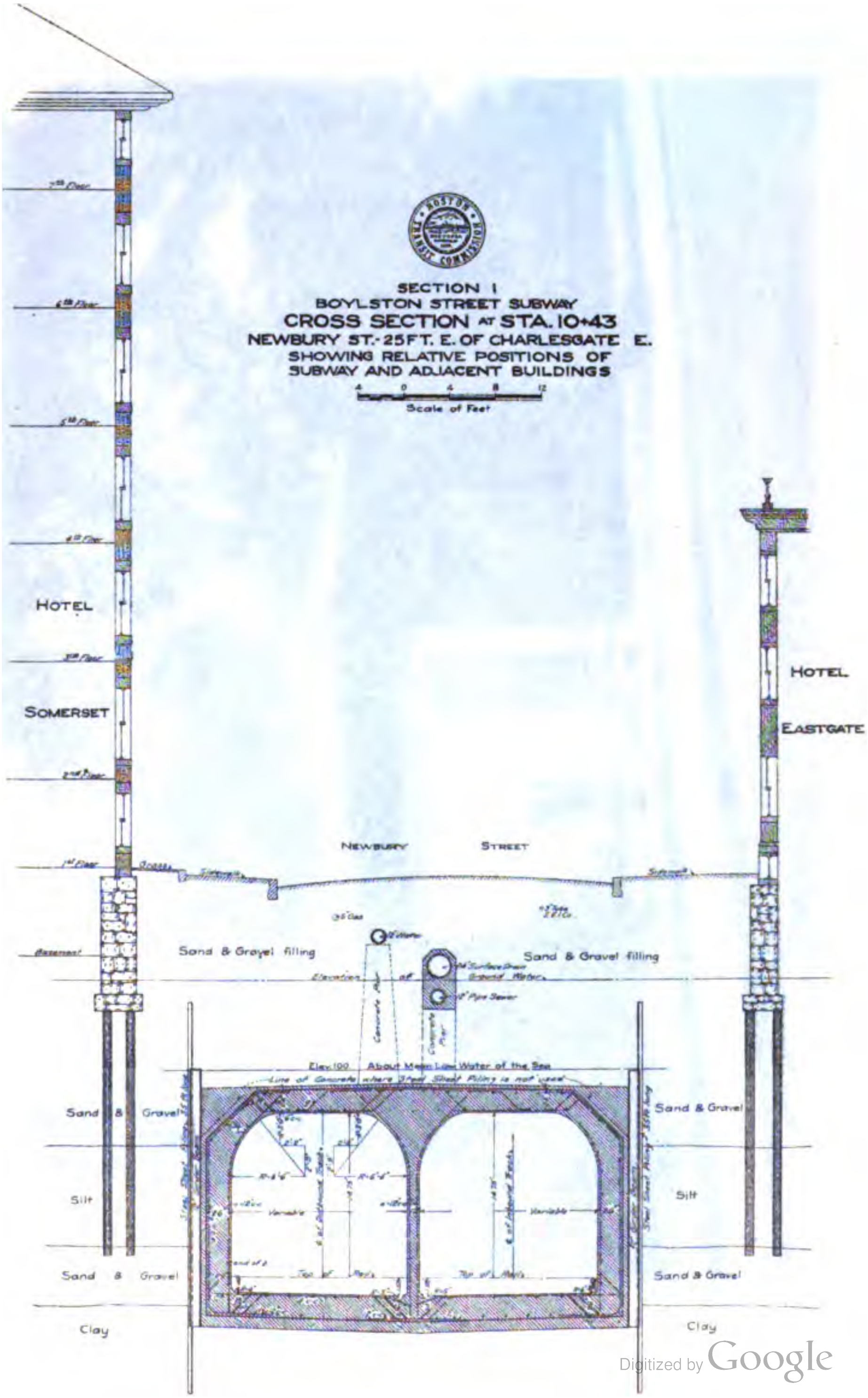
Location and description of structures: Massachusetts station and two-track subway of reinforced concrete and structural steel, from center of Massachusetts avenue, Sta. 19 + 36, to easterly line of Hereford street, Sta. 27 + 50, a distance of 814 feet.

PLATE 5



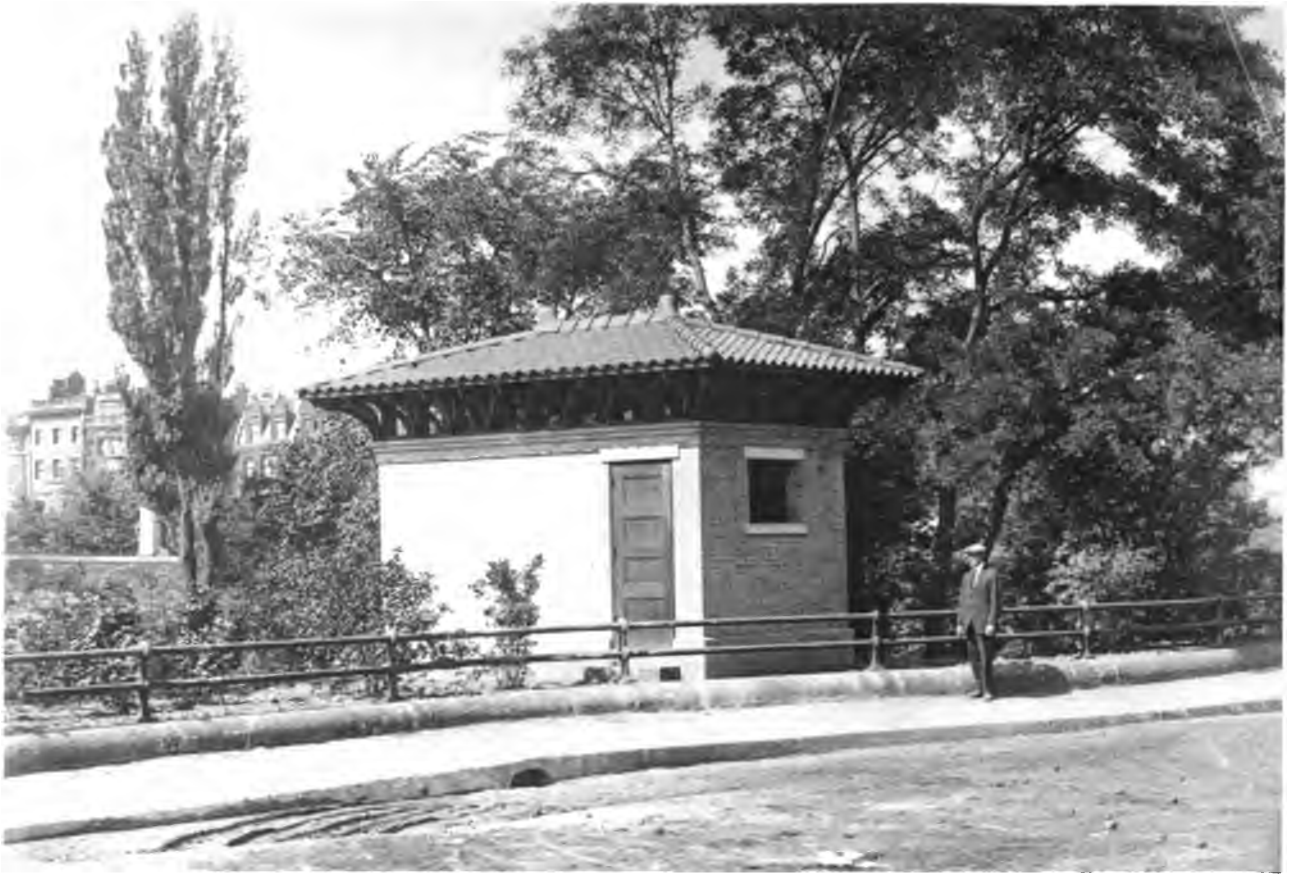
HELIOTYPE CO., BOSTON

BOYLSTON STREET SUBWAY. SECTION 1, LOOKING EASTERLY, IN SOUTHERLY TUBE, FROM UNDER COMMONWEALTH AVENUE NEAR CHARLESGATE WEST.



SECTION I
BOYLSTON STREET SUBWAY
CROSS SECTION AT STA. 10+43
NEWBURY ST.- 25 FT. E. OF CHARLESGATE E.
SHOWING RELATIVE POSITIONS OF
SUBWAY AND ADJACENT BUILDINGS

PLATE 7



HELIOTYPE CO., BOSTON

BOYLSTON STREET SUBWAY, SECTION 1. BUILDING OVER VENTILATION CHAMBER AND EMERGENCY EXIT, CHARLESGATE EAST.

Plate in previous report: XIX., 9.

Contractor and date of contract: Hugh Nawn Contracting Company. (On June 13, 1912, the contract for the construction of Section 1 was extended, at the same unit prices, to include the Massachusetts station, and the contract for the construction of Section 3 was similarly extended to include the rest of Section 2.)

Appendices in this report showing bids: Q, Z, DD, II, MM, NN and OO.

Date of completion named in contract: Within 8 months from date on which contractor is notified to begin work.

Work on the extension of Section 1 is nearly completed.

Date of certificate of completion for extension of Section 3: March 14, 1913.

Dates of beginning: Excavation for Section 1 extension, December 21, 1912; for Section 3 extension, August 21, 1912; Concrete for Section 1 extension, December 24, 1912; for Section 3 extension, September 24, 1912.

Dates of completion: Excavation for Section 1 extension, in progress; for Section 3 extension, January 23, 1913; Concrete for Section 1 extension in progress; for Section 3 extension, March 1, 1913.

Total amount of work done Section 1 extension, to and including June 30, 1914, from beginning of work: Excavation, 15,240 cu. yds.; Old masonry removed, 2,077 cu. yds.; Standard concrete placed, 9,500 cu. yds.; Structural steel placed, 296 tons; Steel rods used for reinforcing concrete, 440 tons. Section 3 extension: Excavation, 14,580 cu. yds.; Old masonry removed, 1,397 cu. yds.; Standard concrete placed, 6,501 cu. yds.; Steel rods used for reinforcing concrete, 394 tons.

Number of men ordinarily employed by the contractor during year ending June 30, 1914: Day, 75; Night, 2.

Character of earth found in excavation: Silt over a layer of sand and gravel.

Disposition of surplus earth: Some by steam railroad to Metropolitan Park at Cottage Farm, Allston, and some dumped at sea.

Contractor for furnishing structural steelwork and date of contract: Lewis F. Shoemaker & Company, September 30, 1912.

Appendix in previous report showing bids: XIX., Q.

Amount of bid: $18,333.00.

About 50 tons of structural steel were fabricated at the shop of the Boston Transit Commission in South Boston.

At Massachusetts avenue, the gap between Section 1 and the two-track portion of Section 2 described in the Nineteenth Annual Report has been filled during the past year by the construction of the Massachusetts station. This station, 350 feet long and 90 feet wide at its widest part, extends from the middle of Massachusetts avenue through private property, across Public alley 444 and into the city storage yard taken from the Public Works Department. Although the subway crosses under Massachusetts avenue well below the surface, its roof is about 12 feet above the surface of the Public alley and yard on the northerly side of the Boston & Albany Railroad, and occupies practically the entire height of parts of the basements of five private stables facing on Newbury street. Easements through these stables have been taken by the Commission.

The building on the property at the southeasterly corner of Massachusetts avenue and Newbury street, which was purchased by the Commission, has been torn down. As access to the rear of the Newbury street stables was cut off by the construction of the subway station, a new alley on the subway roof at a higher level has been provided, which is reached by a short inclined concrete viaduct, constructed in the storage yard on the southerly side of the old alley.

The Massachusetts station consists of two similarly shaped opposite side platforms, a ticket office lobby above the tracks, from which a passageway with stairs 16 feet wide leads to Massachusetts avenue and another passageway with stairs 9 feet wide to Newbury street. A ramp and stairway leads from the easterly end of each platform to the subway roof near Boylston street east of the Boston & Albany Railway bridge. The tracks in the station are separated by a heavy concrete wall. The platforms are similar in shape, each being about 29 feet wide at the foot of the main stairways, and each tapers to a width of 12 feet at the westerly end and to 16 feet at the easterly end. Eight feet from the edge of each platform is a row of heavy columns, which support the roof. As these platforms are constructed for the use of surface cars, they are but three inches above the rail. The ceilings are flat and are about 14 feet 8 inches above the platforms. In case it should be deemed advisable in the future to operate multiple unit trains through this subway, higher platforms could be made. At the side of the main entrance and exit on Massachusetts avenue is a waiting room for the use of passengers who may wish to transfer to surface cars.

The lower part of the station was built in an excavation 10 feet below the surface of the storage yard and is supported through 7 feet of silt by wooden piles, or in places under the buildings where the driving of piles was impracticable, by concrete piers. The invert and foundations are designed to support a future building which may be constructed over the subway. The construction of the portion of the station beneath the stables, involving as it did the temporary support of the buildings above, was a difficult and tedious process, but was accomplished with but slight interference with the use of the stories above the basements. At the Massachusetts avenue entrance and exit, where the waiting room is built close to the line of the Boston & Albany Railroad property, the nearest track was temporarily supported on piles by the Railroad Company in co-operation with the Transit Commission while the excavation and construction of the subway foundations were in progress.

STABLE AND GARAGE FOR POLICE DEPARTMENT.

The remodeled stable and the garage built by the Transit Commission for Station 16 of the Police Department was ready for use January 7, 1914.

Practically the whole of the original stall building was torn down in 1912, to make room for the subway at the point where it passes into Boylston street from the old City storage yard, making it necessary for the Police Department to keep its horses temporarily in a private stable on Newbury street. To compensate for this loss of room the Commission has remodeled the lower floor of the building facing on Public alley 444, where the patrol wagon was formerly housed, by providing stalls for twenty-three horses and has built a small addition at the side of the subway for a box stall for temporarily disabled horses. On top of the subway and connecting with the other buildings, a building has been constructed with an entrance on Boylston street for the department's automobile patrol wagon and ambulance. This new building is of concrete and granite. The builder was the A. Varnerin Company and the architects were Messrs. Coolidge and Carlson.

SECTION 3.

Construction Data.

Location and description of structures: Two-track subway of reinforced concrete, from easterly line of Hereford street, Sta. 27 + 50, to about 137 feet east of Exeter street, Sta. 45 + 54, a distance of 1,804 feet.

Plates in previous annual reports and in this report: XVIII., 2, 7; XIX., 10; XX., 8.

Contractor and date of contract: Hugh Nawn Contracting Company, May 9, 1912.

Amount of bid: $413,135.00.

Appendices in previous report and in this report showing bids: XVIII., CC; XX., SS.

Date of completion named in contract: April 1, 1913.

Date of certificate of completion: February 18, 1913.

Dates of beginning: Excavation, May 13, 1912; Concrete, June 1, 1912.

Dates of completion: Excavation, January 20, 1913; Concrete, February 18, 1913.

Total amount of work done to and including June 30, 1914, from beginning of work: Excavation, 76,597 cu. yds.; Old masonry removed, 648 cu. yds.; Standard concrete placed, 23,565 cu. yds.; Structural steel placed, about 19 tons; Steel rods used for reinforcing concrete, 1,740 tons.

Number of men ordinarily employed by the contractor during year ending June 30, 1913: Day, 250; Night, 127.

Character of earth found in excavation: Gravel filling over a layer of silt. Below the silt is a layer of sand and gravel, carrying large quantities of water, and below this is hard blue clay.

Disposition of surplus earth: By steam railroad to Metropolitan Park at Cottage Farm, Allston, and by carts to Fenway in rear of Museum of Fine Arts.

Contractor for bitulithic paving and date of contract: Warren Brothers Company, June 26, 1913.

Amount of bid: $14,100.00.

Appendix in previous report showing bids: XIX., DD.

Date of completion named in contract: July 1, 1913.

Date of certificate of completion: August 13, 1913.

Section 3 was substantially completed before the beginning of the past year, and its location and structural features were described in the Nineteenth Annual Report. Plate 8 shows an interior view looking easterly.

During the summer of 1913 the surfaces of the streets and sidewalks along the line of this section were restored, and normal conditions re-established on Boylston street west of Exeter street. The car tracks were relaid on a concrete base and granite block paving laid around and between the rails. The space between the rails and the curbs between Hereford and Exeter streets was repaved with bitulithic pavement on a 6-inch concrete base by the Warren Brothers Company, contractor.

SECTION 4.

Construction Data.

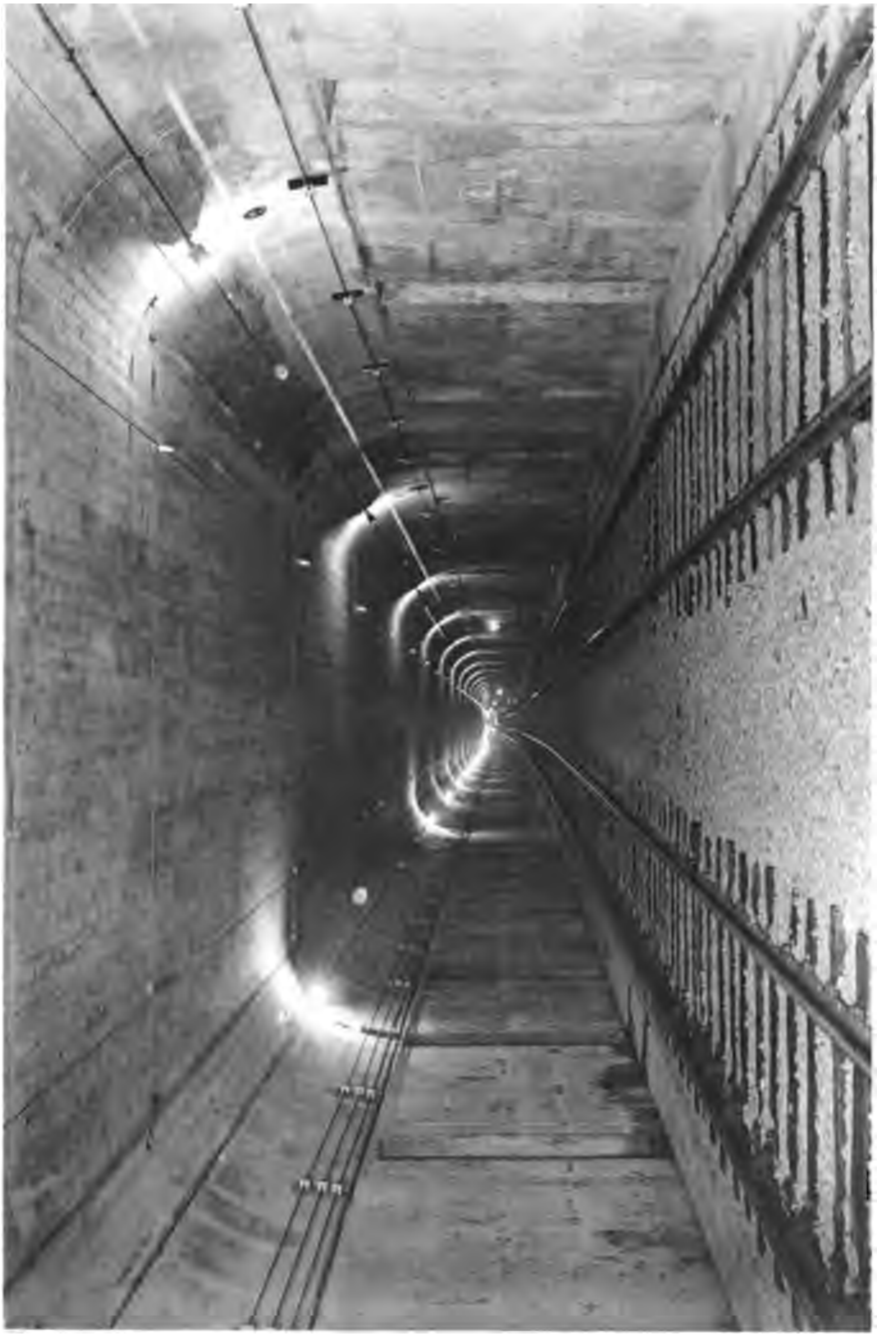
Location and description of structures: Copley station and two-track subway of reinforced concrete and structural steel, from about 137 feet east of Exeter street, Sta. 45 + 54, to near the center of Arlington street, Sta. 69 + 00, a distance of 2,346 feet.

Plates in this report: 9, 10 and 11.

Contractor and date of contract: Hugh Nawn Contracting Company, December 26, 1912. (On February 27, 1913, the contract was extended, at the same unit prices, from about 85 feet east of Berkeley street, Sta. 63 + 51, to near the center of Arlington street, Sta. 69 + 00.)

Amount of bid plus amount of extension of contract: $929,625.00.

Appendices in previous report and in this report showing bids: XIX., W; XX., Y, Z, DD, II, JJ, NN, OO, PP and SS.



HELIOTYPE CO., BOSTON

BOYLSTON STREET SUBWAY, SECTION 3. LOOKING EASTERLY FROM STATION 29+30, NEAR HEREFORD STREET.

Date of completion named in contract: December 31, 1913.

Date of certificate of completion: May 21, 1914.

Dates of beginning: Excavation, January 2, 1913; Concrete, January 20, 1913.

Dates of completion: Excavation, December 2, 1913; Concrete, December 17, 1913.

Amount of work done during year ending June 30, 1914: Excavation, 70,514 cu. yds.; Concrete placed, 22,720 cu. yds.

Total amount of work done to and including June 30, 1914, from beginning of work: Excavation, 133,516 cu. yds.; Old masonry removed, 382 cu. yds.; Standard concrete placed, 36,720 cu. yds.; Steel sheet piling driven, 508.5 tons; Structural steel placed, 528 tons; Steel rods used for reinforcing concrete, 1,837 tons.

Number of men ordinarily employed by the contractor during year ending June 30, 1914: Day, 270.

Character of earth found in excavation: Gravel filling over a thick layer of silt. Below the silt the material varies, being peat in some places, and sand and gravel or blue clay in other places.

Disposition of surplus earth: By steam railroad to Metropolitan Park at Cottage Farm, Allston.

Contractor for furnishing structural steelwork and dates of contracts: Levering & Garrigues Company, November 21, 1912, and December 26, 1912.

Amounts of bids: $5,223.00 and $14,487.60.

Appendices in previous report showing bids: XIX., O and V.

Dates of completion named in contracts: Four months from receipt of order and correct information by which to order material.

Dates of certificates of completion: March 10, 1913, and April 22, 1913.

Section 4 is the longest of the Boylston-street Subway contract sections, and includes the Copley station. The top of the subway roof is 7 feet below the surface at Dartmouth street and 14 feet below the surface at Berkeley street, where it passes below a large sewer. The greatest depth of excavation is between Berkeley and Arlington streets, where the bottom of the structure is 37 feet below the surface. This excavation was made by open cut through soft and yielding ground and for 410 linear feet the structure is supported on wooden piles. The construction of this section, on account of its depth and the character of the ground encountered, involved many engineering difficulties, some of which are described below.

CONSTRUCTION OF THE PART OF THE COPLEY STATION BETWEEN THE OLD SOUTH CHURCH AND THE BOSTON PUBLIC LIBRARY.

The conditions at this point were mentioned in the Nineteenth Annual Report. The problem was to maintain the heavy and leaning tower of the Old South Church in position without further movement while the subway was being constructed in an excavation which was, at its nearest point, 27 feet distant and 17 feet below the bottom of the tower foundation. See Plate 9.

The granite foundation of the tower is stepped out to 37 feet by 42.5 feet, is laid in lime mortar and is supported by wooden piles, the tops of which are cut off at about elevation 103.5, or about 3.5 feet higher than mean low water of the sea. Through lack of definite information the piles were assumed to have been driven through about 15 feet of silt and to penetrate the upper crust of the stratum of clay, which stratum is about 110 feet in thickness. This clay was found by borings to be soft and viscous with the exception of the upper 10 feet, so that this somewhat noted leaning tower, weighing approximately 5,000 tons and extending 231.6 feet above the street or 246.5 feet above the tops of the piles, was, in effect, floated on this compressible material, supported only by piles driven into the silt and the upper crust of the clay. Some of these piles may, during a northeast gale, carry a load of over 30 tons each.

It was considered impracticable, on account of complications and cost, to underpin or extend the foundation of the tower down 130 feet or more in depth to hard material or rock, but instead of such underpinning it was decided to rely on the existing piles and to take special measures to prevent any movement or flow of the silt and clay around or below the piles which would tend to lessen their bearing power. To relieve the bidders of an uncertainty in bidding on Section 4, the responsibility for the safety of the tower under certain conditions was assumed by the Commission, and the construction methods followed at this point were prescribed in detail by the engineering department and were successfully carried out by the contractor. The adopted method of operation is shown in detail on Plate 10. It consisted, in brief, of constructing the subway station in short transverse slices between lines of steel sheet piling previously driven, each slice, on account of the possible upward movement of the bottom of the trench, being completed before the excavation for the next slice had reached a depth of more than 10 feet. As an additional precaution the ground between the sheet piling and the tower was charged with large quantities of neat cement grout with the object of solidifying sand pockets, closing underground water

PLATE 9

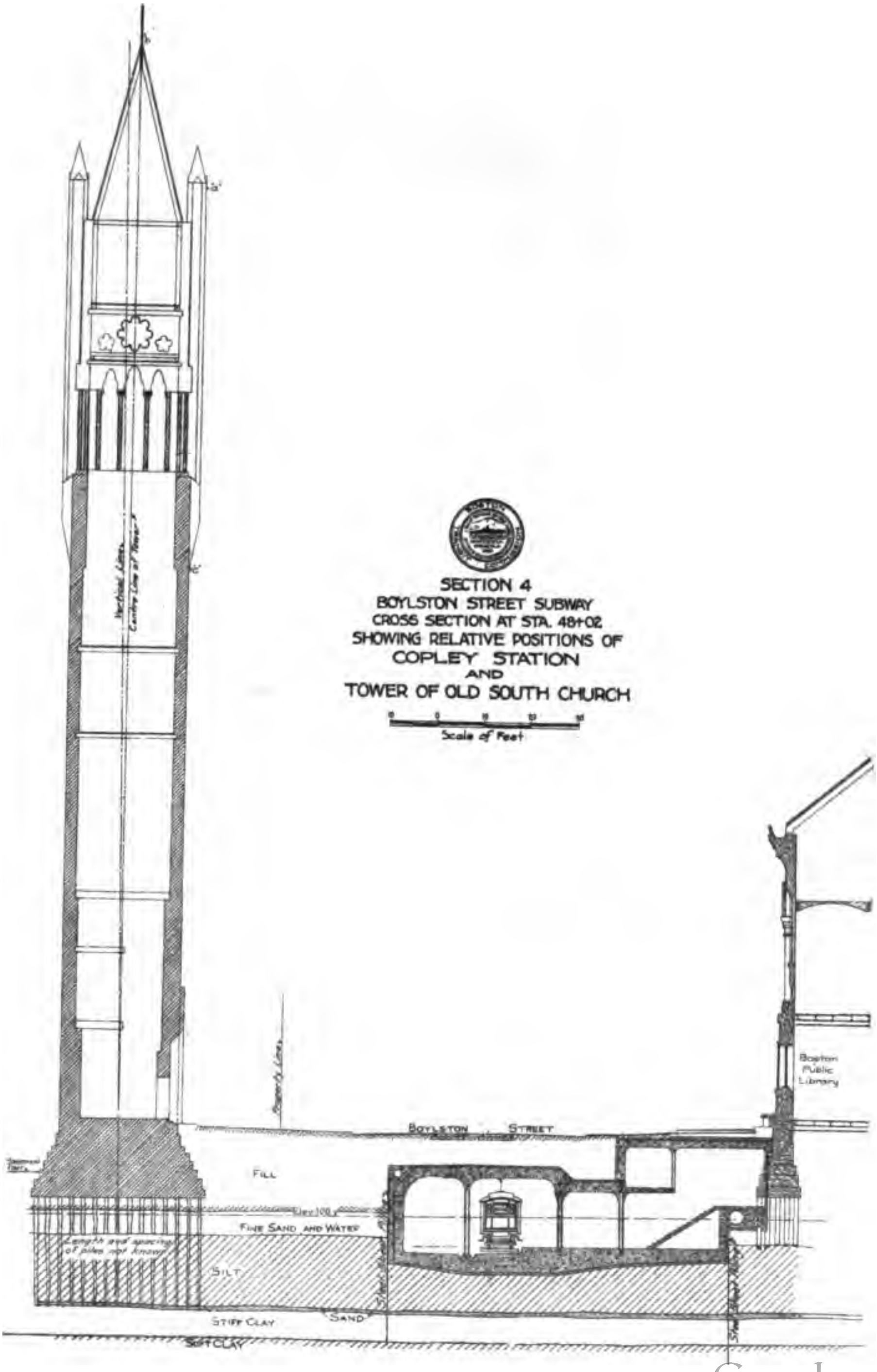
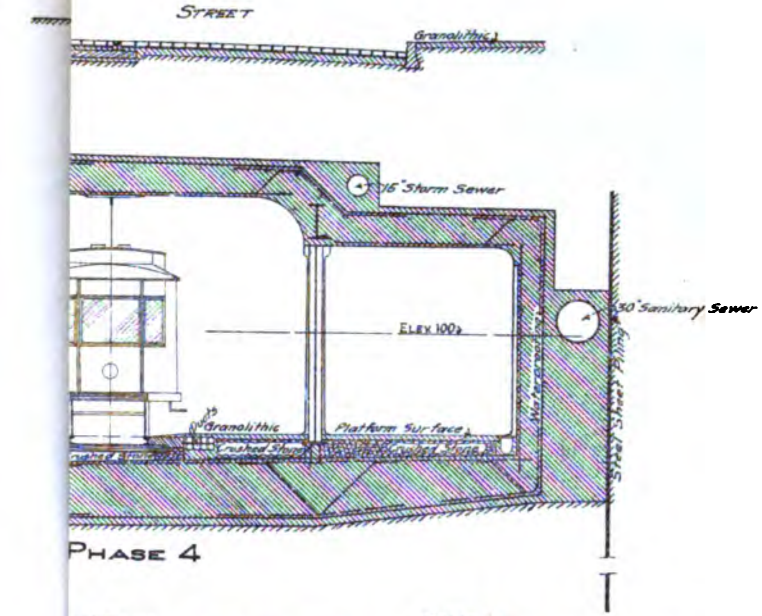
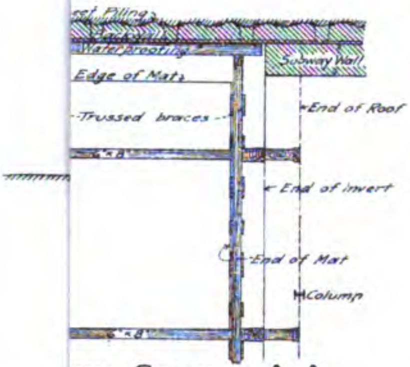

SECTION 4
BOYLSTON STREET SUBWAY
CROSS SECTION AT STA. 48+02
SHOWING RELATIVE POSITIONS OF
COPLEY STATION
AND
TOWER OF OLD SOUTH CHURCH

PLATE 10

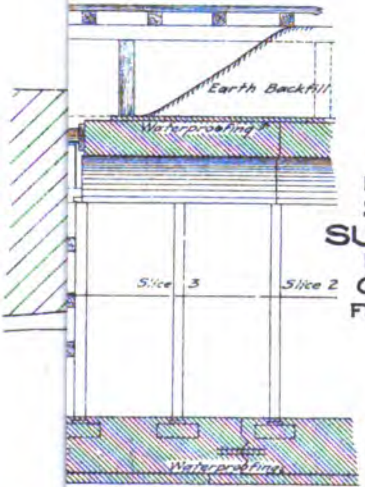


PHASE 4

PHASE 4:-
Main subway structure constructed;
Roof waterproofed;
Protection concrete laid;
Surface drain laid;
Backfilled & paved.
Ground under invert filled
with grout through pipes
left for that purpose.



...ITAL SECTION A-A



...ECTION B-B

BOSTON TRANSIT COMMISSION

SECTION 4
BOYLSTON STREET SUBWAY
SLICE METHOD OF
SUBWAY CONSTRUCTION
IN FRONT OF TOWER
OF OLD SOUTH CHURCH
FROM STA. 45+85 TO STA. 49+30

4 0 4 8 12
Scale of Feet

courses and making the sheeting water-tight. This method of construction was followed for a length of about 200 feet on each side of the tower. Throughout this length, it was decided to rest the subway structure directly on the silt without pile foundations, on account of the possible effect on the tower of the vibrations resulting from pile driving and the risk of lowering the level of the ground water consequent upon sinking foundations to the hard clay. To prevent any lateral movement of the soil below the subway, this section was completely surrounded with steel sheet piling driven into the clay to a depth of about 14 feet below the bottom of the subway. After the portion of the subway was built within the limits of the interlocking steel sheet piling, the silt and other earth beneath the subway structure was filled, through pipes placed in the invert for that purpose, with as much neat cement grout as could be forced in under a pressure until an upward movement was determined by levels carefully taken. The first operation, Phase 1, consisted of driving the steel sheet piling along both sides of the subway and along the westerly side of the lobby under Dartmouth street in a trench about 12 feet wide and 10 feet deep. The sheeting used was the arched web Lackawanna steel sheet piling, 35 feet long and weighing 35 pounds to the square foot. This was driven without difficulty from the bottom of the preliminary trench by means of a Union Iron Works No. 1 hammer, operated by compressed air.

Grouting operations were next begun through 2-inch iron pipes driven to the surface of the clay just outside of the steel sheeting. These grout pipes were spaced 10 feet apart, except in front of the church tower, where they were spaced only 5 feet apart.

Through the open end of each pipe neat cement grout under 90 pounds pressure was forced into the ground until it would take no more; four feet of the pipe was then withdrawn, and the grouting was continued. This was repeated in successive operations until the surface was reached. The full pressure of 90 pounds per square inch proved so great as to lift the surface of the walks, and it was afterward reduced with satisfactory results to 50 pounds per square inch.

After the grouting was completed, the slice method of construction was begun simultaneously at the east and west ends of the sheet piling. The first operation at each opening consisted of the construction of a self-sustaining backwall next to the steel sheeting in narrow trenches 12 feet in length. On the south side this backwall was 4 feet thick, on which was carried a 36-inch sewer; on the north side the backwall was about 12 inches thick and was reinforced with steel rods laid horizontally. As each 12-foot length of this backwall was carried about 5 feet ahead of its corresponding slice, it was supported against an inward movement by the earth core at its forward end and by the completed subway in the rear. As the earth between backwalls was being excavated, these walls were braced apart by a heavy trussed brace set at the top and forward ends to supplement the supporting power of the earth core. These supports were sufficient in most cases to sustain the backwall during the excavation of the core and the placing of the main subway structure, but opposite the church tower for additional support ordinary timber braces were added as the excavation was carried down.

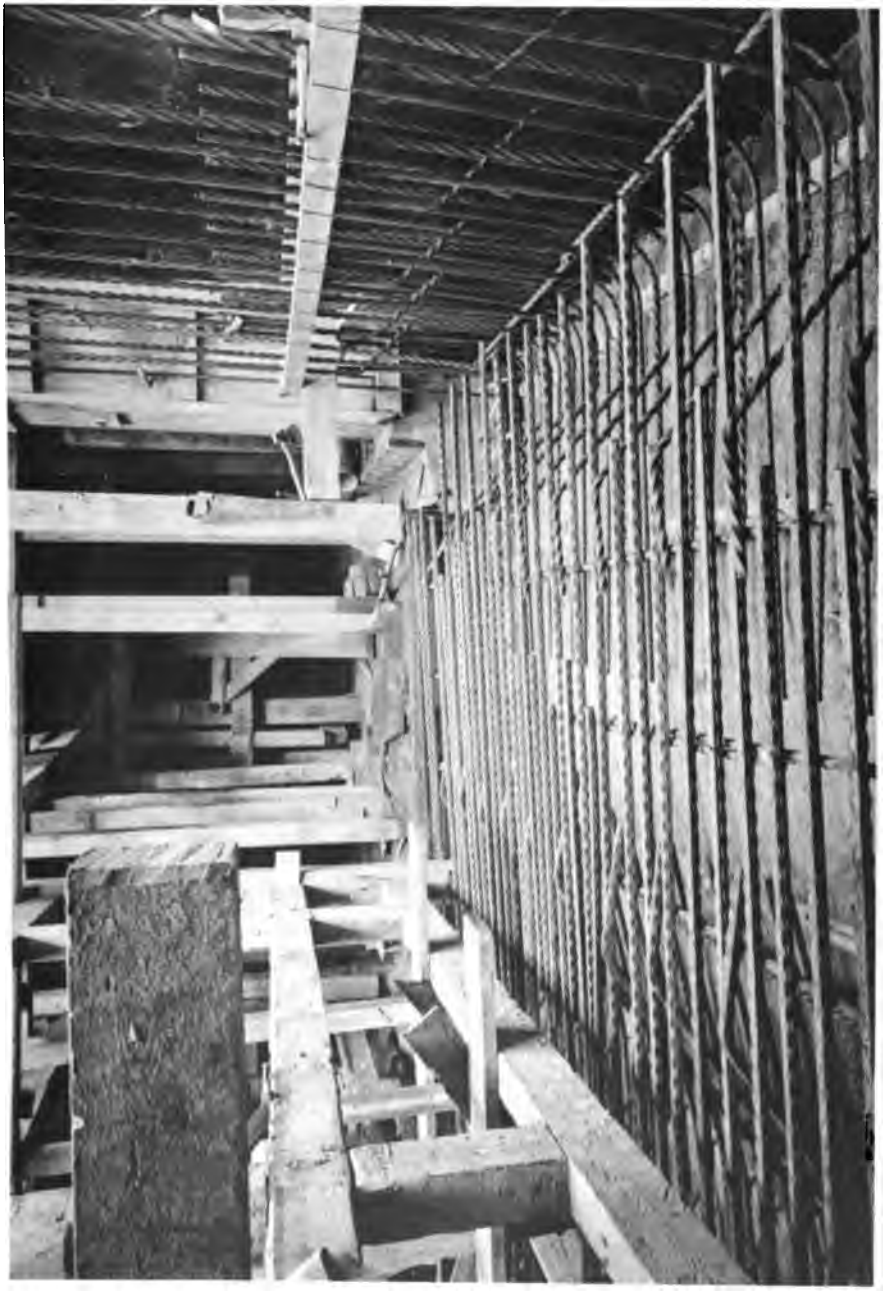
After the excavation between the sidewalls was completed the concrete "mat" was immediately placed and the floor and walls waterproofed. Then the invert was constructed, the sidewalls and structural steel placed and the roof concreted and backfilled in the order named. This cycle of operations for each slice took about seven days.

As soon as the invert was concreted in slice number one, excavation for the backwalls of slice number two was begun, so that by the time the whole of the construction in slice number one was completed, the backwalls for the next slice were finished and core excavation between them could be begun.

Plate 11 shows steel reinforcing rods placed in the invert about 50 feet west of the tower of the Old South Church.

The sheet piling was driven and the grouting of the soil was begun in the early summer of 1913, and the work of subway construction was started at each end, where this method of construction was to be used, during the last of June, 1913. After a short time spent in getting the force organized, rapid construction progress was made, each slice, involving from 740 to 1,100 cubic yards of excavation and from 178 to 200 cubic yards of concrete, being completed in about 7 days. For 20 weeks, during which time the tower was constantly under observation, the slices approached each other, and on Thanksgiving Day, November, 1913, the closing slice was substantially completed.

During this time the church was used as usual. It is now thought that on account of the solidification of the subsoil by grouting, the tower may be more stable than ever before.



BOYLSTON STREET SUBWAY, SECTION 4. STEEL RODS PLACED FOR INVERT REINFORCEMENT
ABOUT 50 FEET WEST OF TOWER OF OLD SOUTH CHURCH.

HELIOTYPE CO., BOSTON

METHOD OF CONSTRUCTING THE PORTION OF SECTION 4 EAST OF THE COPLEY STATION.

The subway was constructed in an open excavation without serious interruption to traffic, except that as a measure of precaution the surface cars were diverted to St. James avenue, as noted in the Nineteenth Annual Report. The absence of street cars greatly expedited subway construction, especially over that portion where a pile foundation was driven.

Following the procedure on earlier work, the subway was constructed by first building the sidewalls in lengths of 40 feet and then removing the intervening earth core and constructing the remainder of the structure, also in lengths of 40 feet. The south sidewall was first constructed on account of a large sewer built in connection with it, and it was desired to have this sewer placed in service at the earliest possible date. The north wall was then built, followed by the completion of the structure. The method of constructing the sidewalls was as follows: First a trench about 8 feet wide at the bottom, and of varying widths at the top, was dug and close sheeted with rough 2-inch spruce planks heavily braced. Then the backwall, 6 inches or more thick at the bottom and thickening with each step out in the sheeting, was concreted. This backwall was built in several operations, each "lift" rising to the bottom of the next set of braces above. After the concrete in the first "lift" had hardened, the sides of the trench were rebraced to vertical timbers set so as to clear the completed sidewall, and the set of original braces and the rangers next above on the wall side were removed. This operation was repeated until the entire backwall was concreted. The waterproofing was then applied to the backwall and to a narrow section of concrete "mat" 6 inches in thickness under the sidewall and part of the invert. The braces against the backwall were removed one at a time, and replaced against the waterproofing as fast as it was applied. Then the reinforcing rods were set in place and wired together, the inside steel forms set up and the sidewall of the subway concreted in one operation. During the concreting of the sidewall the short braces from the vertical timber to the backwall were removed as fast as the concrete rose to their level and were replaced against the sidewall forms just below. By this method of operation the banks were at all times supported without leaving any lumber, except the outside sheeting, in the ground, and provision was made for the application of a continuous membrane of waterproofing without patches around the braces, both important factors in ground as unstable and wet as that here encountered.

RESTORATION OF 42-INCH WATER PIPE AT CLARENDON STREET.

The temporary diversion of the 42-inch water pipe formerly crossing the route of the subway at Clarendon street was noted in the Nineteenth Annual Report. The service was maintained in the temporary pipe through Dartmouth and Newbury streets until December 9, 1913, when the pipe was reconnected over the completed subway roof at Clarendon street. A portion of the temporary pipe in Dartmouth street was removed shortly after.

The new connection was made by laying 169 linear feet of 36-inch cast-iron pipe with flexible joints, such as is used for under-water crossings. The new pipe is supported rigidly on the subway roof at the Clarendon street crossing. The flexible jointed pipe was used at the request of the Public Works Department as an insurance against breakage, which might result from settlement of the ground at the sides of the subway if the ordinary pipe were used in this important line.

SECTION 5.

Construction Data.

Location and description of structures: (See text below.)

Contractor and date of contract: Hugh Nawn Contracting Company, September 15, 1913.

Date of completion named in contract: May 1, 1914.

Work is still in progress.

Appendices in this report showing bids: DD and TT.

Dates of beginning: Excavation, September 16, 1913; Concrete, October 25, 1913.

Total amount of work done to and including June 30, 1914, from beginning of work: Excavation, 58,523 cu. yds.; Old masonry removed, 16 cu. yds.; Standard concrete placed, 14,500 cu. yds.; Structural steel placed, 463 tons fabricated at the South Boston shop of the Boston Transit Commission; Steel sheet piling driven, 31 tons; Steel rods used for reinforcing concrete, 1,042 tons.

Number of men ordinarily employed by the contractor during year ending June 30, 1914: Day, 270; Night, 330.

Character of earth found in excavation: Gravel filling over silt and peat.

Disposition of surplus earth: Some sent to the site for the Massachusetts Institute of Technology in Cambridge, and some sent to scows and dumped at sea.

Section 5 is the connecting link between the new Boylston-street Subway and the existing Tremont-street Subway. Through this section, under the proposed temporary arrangement of tracks, cars from both the surface and the new subway will connect with the Tremont-street Subway, and under the permanent arrangement an opportunity will here be provided for switching between tracks so that wherever the permanent terminus of the Boylston-street Subway may be, it will also be possible to transfer Boylston-street Subway cars to Park street.

The general arrangement of this section may be described as follows: At Arlington street, the Boylston-street Subway tracks begin to diverge and at Church street the surface tracks descend between them through the new incline to a stretch of four-track subway, 65 feet wide, in which surface and subway cars bound in the same direction proceed side by side. At this place the temporary connection between the tracks is to be made, and at this place in the future when the subway tracks are extended it will be possible by switching to transfer both in and out-bound cars at will between the surface and subway systems without crossings at grade for cars going in opposite directions. The new incline, 360 feet long and on a 4% grade, is situated nearly in the middle of Boylston street, which has been widened for this purpose by taking from the Public Garden between Arlington and Charles streets a strip of land 40 feet wide. This arrangement provides for a roadway on each side of the new incline and will do away with the dangerous crossing of out-bound vehicles over the car tracks.

As the subway from Arlington street eastward widens, the roof is supported first by the standard steel column and longitudinal girder arrangement as used on Section 4, and then further east by two interior concrete walls. Beneath the incline the structure divides into two barrels of reinforced concrete which at the portal of the incline merge into a four-track subway with interior columns and a roof of transverse jack arches, between 26-inch Bethlehem girders. The greater part of this section is constructed through a pocket of peat, where the structure is supported on a pile foundation. Nearly opposite Church street this peat is about 28 feet in thickness.

The portion of the work completed during the year under review has been practically the whole of this section with the exception of the final connection with the Tremont-street Subway. The change of traffic from the old incline in the Public Garden into the new incline will be made by changing one track at a time and after the out-bound track is finally connected with the Tremont-street Subway the old subway will be bulkheaded at the corner of Charles and Boylston streets and the old incline will be filled with earth and most of its area restored to the Public Garden.

A feature of the construction of this section was the method of supporting the sides of the excavation for the south wall between the Hotel Thorndike and Park square. Throughout this length, 3-inch yellow pine tongued and grooved sheet piling was driven in advance of the deep excavation and 16-foot slices of subway were constructed by a method similar to that adopted at the Old South Church. For about 65 linear feet near the corner of Boylston and Carver streets steel sheet piling was driven to protect the seven-story building on the south side of Boylston street. The construction of the sidewall and subway at this point was also carried on according to the same method as previously described for Section 4.

At Church street, where a large sewer formerly crossed Boylston street, it was necessary on account of the grades to offset the line of and construct a new sewer crossing over the subway 87 feet westerly from the old location. On this account, 222 linear feet of concrete sewer from 5 feet 9 inches to 6 feet 9 inches in diameter was constructed to take the place of 110 linear feet of brick sewer removed.

EAST BOSTON TUNNEL EXTENSION.

SECTION G.

Construction Data.

Location and description of structures: Section G begins in Court street near the westerly end of the Ames Building and extends to a point under Court street opposite Stoddard street and includes a station for the East Boston Tunnel extension under and near the existing station in Scollay square. It is being constructed of reinforced concrete and structural steel.

Assistant Engineer in charge of construction: Robert B. Farwell.

Contractor and date of contract: Isaac Blair & Company, Inc., December 2, 1912.

Dates of beginning: Excavation, November 29, 1912; Concrete, December 21, 1912.

Amount of work done during year ending June 30, 1914: Excavation, 24,400 cu. yds.; Concrete, 6,320 cu. yds.; Structural steel placed, 584 tons; Steel rods used for reinforcing concrete, 337 tons.

Total amount of work done to and including June 30, 1914, from beginning of work: Excavation, 44,000 cu. yds.; Concrete 9,700 cu. yds.; Structural steel placed, 607 tons; Steel rods used for reinforcing concrete, 500 tons.

Number of men ordinarily employed by the contractor during year ending June 30, 1914: Day, 157; Night, 94.

Character of earth found in excavation: The ground below a few feet of filling generally consists of a mixture of sand, gravel and clay, until about 30 feet below the surface, after which the blue clay is generally continuous.

Disposition of surplus earth: Some of the surplus was sent to the site for the Massachusetts Institute of Technology in Cambridge, and some sent to scows and dumped at sea.

Contractor for furnishing structural steelwork and dates of contracts: Bethlehem Steel Company, September 19, 1912; December 12, 1912; November 14, 1913.

At the date of the last annual report most of the work on this section northwesterly of the Tremont-street Subway had been done and a fair start had been made underneath the subway. The sidewalls were first built in drifts, if under the old subway. Then the work of building the new station under the old was generally done by excavating cross drifts 6 feet wide with 6 feet of earth left between the drifts and placing concrete footings for the columns and afterwards the columns in position, then driving other drifts from one column to another in which to set the longitudinal girders. Excavation for setting the transverse beams proceeded next, and with the old structure thus supported, the excavation below was finished and the concrete invert and platform built. This process required exceedingly careful work and the portion under the old Scollay-square station of the subway has been nearly finished. The sidewalls have also been mostly built in Court street easterly as far as the City Hall Annex. The buildings have been underpinned during the year in connection with the sidewall work on the northeasterly side from the Crawford House to No. 41 Court street. Underpinning farther to the east is proceeding.

In connection with this work, the old Scollay-square station is being widened on the westerly side so as to give greater length and width to the center platform. This necessitates the removal of about 250 feet of the westerly wall and the construction of a new wall instead. The exit building in front of the Crawford House has been removed to make way for an inclined elevator, which will come to the surface from the platform of the new station for the East Boston Tunnel extension. Stairways will connect the platforms of the new station to the present subway station platforms and to the surface of the street. Work on an entrance at the corner of Hanover and Court streets has begun.

SECTION H.

Construction Data.

Location and description of structures: Section H is located in and near Court and Cambridge streets. It extends from Stoddard street to Staniford street, and includes the Bowdoin station. The structure is of reinforced concrete and structural steel.

Assistant Engineer in charge of construction: Robert B. Farwell.

Contractor and date of contract: Coleman Brothers, February 19, 1914.

Amount of bid: $372,400.

Appendix in this report showing bids: EE.

Date of completion named in contract: December 31, 1914.

Dates of beginning: Excavation, March 2, 1914; Concrete, March 6, 1914.

Amount of work done during year ending June 30, 1914: Excavation, 22,800 cu. yds.; Concrete, 5,000 cu. yds.; Structural steel placed, 66 tons; Steel rods used for reinforcing concrete, 271 tons.

Number of men ordinarily employed by the contractor during year ending June 30, 1914: Day, 137; Night, 110.

Character of earth found in excavation: Below 8 to 10 feet of filling, the ground usually consists of clay mixed with sand.

Disposition of surplus earth: Mostly to scows and dumped at sea.

Contractor for furnishing structural steelwork and dates of contracts: Bethlehem Steel Company, September 19, 1912; December 12, 1912; November 14, 1913.

The construction of this section requires the supporting and underpinning of numerous buildings on Court street, Green street, Cambridge street, Bowdoin square and Moss place. This supporting work is about one-half done, most of it being necessarily done in advance of the sidewall construction. The walls are then built, after which the core is removed and the remainder of the structure completed. On account of the proximity of the buildings much care is required in the work, even where underpinning is not being done. New sewers are being built in connection with the work throughout the section and this sewer reconstruction has been carried a length of about 500 feet down Chardon street and nearly 200 feet down Sudbury street. The work on the tunnel is being pushed expeditiously and at this date the section is nearly one-half done, about 100 feet in length next to Section G being practically finished, as is also a strip of about the same length next to Section J.

SECTION J.

Construction Data.

Location and description of structures: Section J is located in and adjacent to Cambridge street and extends from Staniford street to North Russell street and includes an open inclined approach extending from Chambers street to North Russell street. The structure is mainly of reinforced concrete with steel roof beams for a portion of the way.

Plate in this report: 12.

Assistant Engineer in charge of construction: Robert B. Farwell.

Contractor and date of contract: Coleman Brothers, September 25, 1913.

Amount of bid: $86,130.

Appendices in this report showing bids: M, T, U, V and UU.

Date of completion named in contract: May 1, 1914.

Date of certificate of completion: May 18, 1914.

Dates of beginning: Excavation, September 30, 1913; Concrete, October 2, 1913.

Dates of completion: Excavation, April 30, 1914; Concrete, May 14, 1914.

Amount of work done during year ending June 30, 1914: Excavation, 13,419 cu. yds.; Concrete, 4,316 cu. yds.; Structural steel placed, 76 tons; Steel rods used for reinforcing concrete, 201 tons.

Number of men ordinarily employed by the contractor during year ending June 30, 1914: Day, 77; Night, 14.

Character of earth found in excavation: Below a few feet of filling the earth consisted of a mixture of sand, gravel and clay.

Disposition of surplus earth: Mostly sent to a dumping ground in Cambridge near the Cambridge bridge. Some sent to scows and dumped at sea.

Contractor for furnishing structural steelwork and dates of contracts: Bethlehem Steel Company, September 19, 1912; December 12, 1912; November 14, 1913.

The buildings on the northerly side of Cambridge street between Chambers street and North Russell street were torn down and removed in July and August, 1913, by Robert R. McNutt, Inc. The building on the westerly corner of North Russell street was similarly removed in November by the Swift Contracting Company. Coleman Brothers started the actual work of subway construction September 30, where the buildings had been removed by the McNutt Company, and before the end of 1913 had completed the open incline between Chambers street and North Russell street. The work on the covered portion from Chambers street to Staniford street was carried on during the fall and winter and into the following spring, being practically completed May 18. The structure extended into the basements between Chambers and Lynde streets and the buildings were supported over the excavation and their foundations finally pinned off upon the tunnel roof. A permanent pump well was built under Chambers street at the low point in the grade near the easterly end of the incline.

The general method was to build the sidewalls in separate trenches, then excavate deep enough to build the roof, and finally to remove the core and place the invert. New sewers were built on both sides of the structure throughout the section. The work in this section included the construction of the new portion of Cambridge street to the north and west of the incline.

STOCK YARD AT SOUTH BOSTON.

Assistant Engineer in charge: Philip B. Walker.
Inspector in charge of structural steel work: Alfred W. Parker.

At the Cypher-street Stock Yard in South Boston, a structural steel shop has been erected, having a floor area of 1,900 sq. ft. This shop is equipped with a 26-inch rotary planer, a large punch and shear, having a capacity to punch a 2-inch hole in a 1½-inch plate, and to shear 7-inch by 1½-inch bars, a small punch and shear, a 5-ton travelling crane, air drills, chippers, electric drills and other necessary tools. The air for operating the drills and chippers is supplied by an electrically driven air compressor having a capacity of 164 cu. ft. of free air per minute. Additional space for a templet room has also been provided. All the structural steelwork to be used on the sections of the tunnels and subways under construction will be fabricated at this shop.

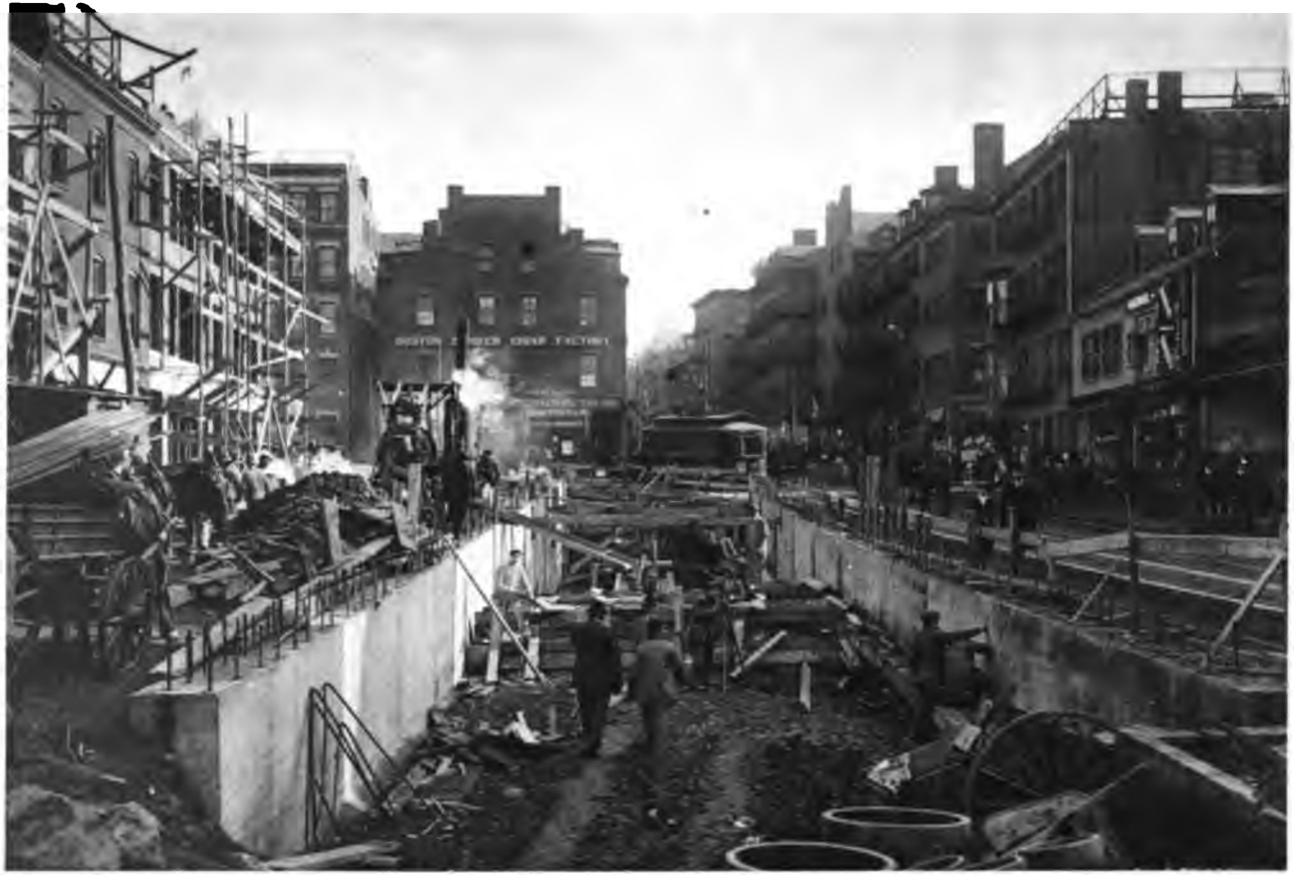
The following amounts of material have been received at the yard the past year:

Waterproofing fabric	191,000 sq. yds.
Asphalt for waterproofing	550 tons
Reinforcing rods	2,900 tons
Structural materials	2,300 tons
Cast-iron sewer pipe	188 tons
Cement	18,000 bbls.

Some material was on hand at the beginning of the year. Deliveries have been made from this yard as follows:

Waterproofing fabric	179,102 sq. yds
Asphalt for waterproofing	400 tons
Reinforcing rods (cut and bent)	3,471 tons
Structural steel	1,950 tons
Cast-iron sewer pipe	360 tons
Cement	18,500 bbls.

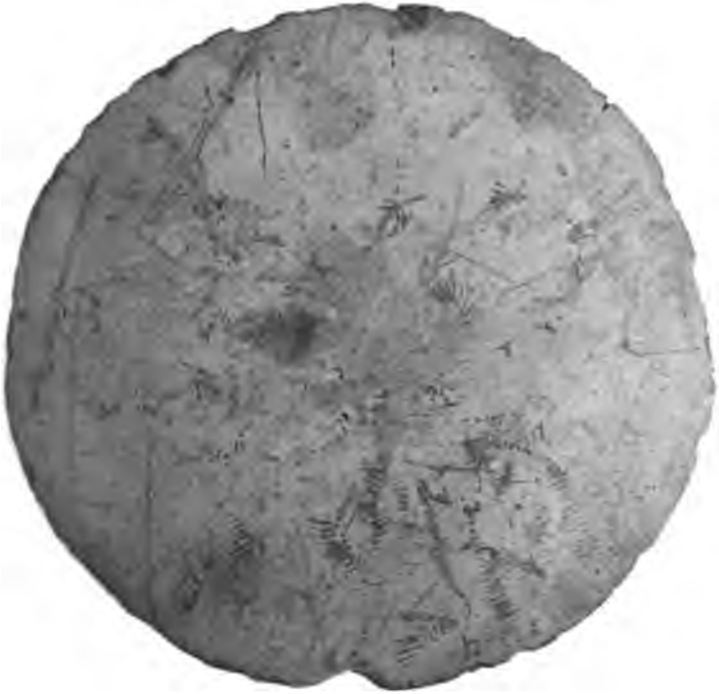
PLATE 12



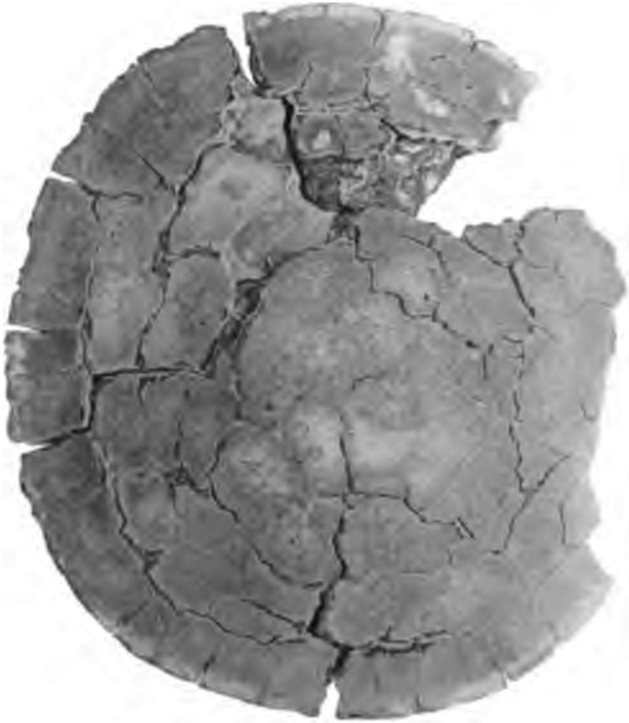
HELIOTYPE CO., BOSTON.

EAST BOSTON TUNNEL EXTENSION, SECTION J. CONSTRUCTING THE INCLINE IN CAMBRIDGE STREET BETWEEN NORTH RUSSELL AND CHAMBERS STREETS, LOOKING EASTERLY. NOV. 22, 1913.

PLATE 13



Pat made of Portland cement containing 6.23 per cent. of Alumina.
Photograph taken when pat had been in concentrated sea water 77 days.
First crack appeared on the 59th day.



Pat made of Portland cement containing 7.55 per cent. of Alumina.
Photograph taken when pat had been in concentrated sea water 73 days.
First crack appeared on the 15th day.

PLATE SHOWING ACTION OF SEA WATER ON TWO OF THE VARIOUS KINDS OF PORTLAND CEMENT TESTED.

The experiments showed that the kinds containing the larger percentage of alumina in general began to deteriorate first. In order to accelerate the tests, 5 per cent. of plaster of Paris was mixed with the cement and the sea water was concentrated to a brine three times stronger than ordinary sea water.

WORK DONE IN THE CEMENT TESTING DEPARTMENT AND CHEMICAL LABORATORY FOR THE YEAR ENDING JUNE 30, 1914.

Chemist and Chemist Tester: Harold C. DeLong.

In the cement testing department samples from about 135,000 barrels of cement have been tested for use in the various subways and tunnels under construction. The regular routine tests which have been made on this cement are as follows:

Boiling test for soundness.
Fineness by the 100 and 200 mesh sieves.
Setting time by the Gilmore wires.
Tensile strength of neat briquettes at the ages of 24 hours, 7 days and 28 days, and of mortar briquettes in the proportion of 1 cement to 3 Ottawa sand at the ages of 7 days and 28 days.

Occasional tests have been made for specific gravity.

In November, 1913, a test was started to determine the effect of sea water on various brands of American Portland cement. Sixteen different brands were tested. The cement was made into neat pats, mortar pats, and briquettes. These were subjected to the action of a concentrated sea water, three times as strong as ordinary sea water. At the same time the cements were analyzed in the chemical laboratory. The results of the sea water test showed in general that those cements relatively low in alumina ($Al_2 O_3$) resisted the disintegrating action of the sea water much better than those cements relatively high in alumina. Plate 13 shows a pat made of a low alumina cement and a pat made of a high alumina cement. Both have been subjected to the action of concentrated sea water for about the same length of time. The pat of low alumina cement has been but slightly affected, while the pat of high alumina cement is badly disintegrated. Five per cent of plaster of Paris was added to each of these pats in order to accelerate the action.

In this department the aggregates used for concrete by the contractors have been regularly inspected and, in the case of sand, samples have been taken and various tests made to determine its fitness for the work.

In the chemical laboratory the work has chiefly consisted of the occasional analyses of the cements in use, especially for sulphuric anhydride (SO_3), the analysis of ground water and leakage water from various parts of the work, and the analysis and testing of various materials submitted by business concerns interested in introducing their materials into the subway work. Most of the latter are waterproofing materials of all classes, though there were a number of products used in the finish work about stations. Many of the products submitted, while doubtless useful in ordinary building construction, have not been found suitable for use under the severe conditions existing in subway work.

ENGINEERING FORCE.

The names of all of the assistants who have been employed more than one month during the past year are given in Appendix L.

Respectfully submitted,

EDMUND S. DAVIS,
Chief Engineer.

APPENDIX A.

REPORT ON CHAPTER 810, ACTS OF 1913.

THE COMMONWEALTH OF MASSACHUSETTS.

BOSTON TRANSIT COMMISSION, 15 BEACON STREET,
BOSTON, May 19, 1914.

To the Senate and House of Representatives.

Chapter 810, Acts of 1913, a copy of which is appended hereto, provides in section one, as follows: —

> The Boston transit commission, hereinafter called the commission, is hereby authorized and directed to investigate and report to the next general court whether or not, in view of the traffic to be served and the additional expense involved, it is desirable to alter the route of the Boylston street subway, as defined in chapter seven hundred and forty-one of the acts of the year nineteen hundred and eleven, by abandoning the construction of that part of the Boylston street subway between Boylston street and Park street, in the city of Boston, and in place thereof extending said subway through Boylston street to Washington street, and from Washington street by some route to Post Office square, providing for an exchange of traffic with the Tremont street subway at or near the corner of Tremont and Boylston streets, with the Washington street tunnel at or near the corner of Boylston street and Washington street, and with the Dorchester tunnel at some convenient point. In case the commission is of the opinion that it is desirable to alter the route of the Boylston street subway, it is requested to state in its report the precise route which it would recommend and the additional expense involved, and to submit with its report a draft of a bill embodying such legislation as may be necessary to carry out its recommendations. The cost of the above investigation and report shall be deemed a part of the cost of the Boylston street subway.

Prior to the passage of this act, an order was passed by the Senate, April 18, 1913, requesting the Transit Commission to report to the Senate as to the probable cost of extending the so-called Boylston street subway to Post Office square, and asking it to give its opinion as to the precise route to be followed in case such extension should be made, and as to whether it considered it desirable to adopt such a route.

In accordance with this request, the Transit Commission submitted to the Senate, under date of May 9, 1913, a report covering this subject, discussing several alternative routes, their advantages and disadvantages, and giving its opinion on the questions referred to. This order of the Senate, and the report of the Transit Commission in accordance therewith, are also appended hereto.[1]

In regard now to the report asked for by section 1, chapter 810, the Transit Commission begs leave to make the following report:—

During the past year, as provided in said chapter 810, the Commission has completed plans and awarded contracts for the completion of the Boylston street subway to a temporary connection with the present subway at a point near Park square. The subway will be completed to this point within a few months from this date, and it is expected that it will be open to operation in the fall.

---

[1] For order, see Senate Journal, 1913, p. 1093. For Report, see Senate Document, No. 534 of 1913.

As provided in section 4 of chapter 810, Acts of 1913, the Commission under date of Sept. 29, 1913, made the proper modifications in the contract for the use of the Boylston street subway rendered necessary by connecting it temporarily with the present Tremont street subway.

Chapter 741, Acts of 1911, authorizing the construction of the Dorchester tunnel, gives this Commission authority to enlarge the present Park street station of the Tremont street subway. As this subway is operated under lease, it was, of course, necessary to secure the approval of the Boston Elevated Railway Company before such enlargement could be made. This approval has recently been secured. The Commission is now preparing plans for this enlargement and it is its purpose to enter upon the work of construction at the earliest practicable date.

In the opinion of the Commission, it is in itself desirable that passengers using the Boylston street subway should be able to reach some point near the center of the business district, like Post Office square, and also the South Station, without changing cars. It is the unanimous opinion of the Commission, however, that it would not be desirable for such a point to be made the only terminus of the Boylston street subway. That is to say, it would not be desirable that all of the cars going from the west in that subway should run to Post Office square or the South Station and nowhere else. Some of these cars might be run to these points, but others should run to Park street. The count of traffic referred to in the report submitted by the Commission last year, showed that a majority of the passengers who expressed their opinion preferred Post Office square; but almost as large a number were in favor of Park street. The Commission believes, therefore, that, if chapter 741 of the Acts of 1911, which provides for making the only terminal of the Boylston street subway at Park street, is to be amended, it should only be amended in such a way as would permit the subway to be forked so that some cars might run to Park street and others to some terminus farther east. The provision of such a double terminus is not only desirable from the point of view of convenience of transportation but also because it would assist in relieving the congestion of streets. This last advantage is particularly desirable in Boston where the streets and sidewalks in the business district are so narrow and congested. Any transportation improvement which will take large numbers of people as near as possible to the precise point which they wish to reach will by so much relieve the sidewalk traffic.

While such an arrangement would be in itself desirable, the cost of an extension of the tunnel to Post Office square would be large, and in view of the fact that by going to Park street and transferring to the Dorchester tunnel, passengers will be able to reach Dewey square and the corner of Summer and Chauncy streets, and that by making still other transfers they can reach any point on the lines of the Washington street tunnel or the East Boston tunnel, it is questionable whether under all the circumstances the additional expense of building another tunnel to Post Office square would be justified at the present time.

The business section of Boston covers a comparatively small area, and within this area there is apparently already provided a greater mileage of subway and elevated lines than in any equal area in any American or foreign city, with the possible exception of London and New York. The area of the peninsula of Boston, bounded by the Charles river, the harbor, Fort Point channel, Dover and Berkeley streets, is only about 1.80 square miles. Within this area there are already in operation, or under construction, about 9.05 miles of subway and elevated lines, with about 19.7 miles of single track. If the area were square, this mileage would provide for double track rapid transit lines crossing it in each direction at intervals only about 1,800 feet apart. Taking the actual shape of the area, there is no part of the business district east of Beacon Hill, which is more than about 1,100 feet distant from some rapid transit line. The distance from the Washington street tunnel, a through line north and south, to Atlantic avenue at the head of docks along the harbor on the east is about 2,000 feet. There are three north and south rapid transit lines through this district, namely, the Tremont street subway, the Washington street tunnel and the Atlantic avenue elevated line, and the distance between adjacent lines is nowhere more than about 2,200 feet; and there are two rapid transit lines east and west through the district, namely, the East Boston tunnel and the Dorchester tunnel and these are nowhere more than about 2,800 feet apart.

It is thus evident that the business section of Boston is already well provided with underground and overhead rapid transit lines; and by transfers it is possible to reach any point on any one of these lines, going in the same general direction, for a single fare.

These figures will perhaps illustrate the character of the facilities which have already been provided, and will show the need of exercising great caution before advising the construction of another underground line in this limited district at the present time.

The Commission, therefore, feels that at the present time the permanent termini of the Boylston street subway should not be fixed. The requirements of urban transit must be determined largely from experience. It is expected that the extension of the East Boston tunnel, which will largely increase the capacity of that tunnel, will be completed some time in 1915. It is also expected that the Dorchester tunnel will be completed to the South Station, and it is hoped that it will be put into operation to that point some time in the same year. When the Dorchester tunnel is in operation to the South Station, passengers from all points of the city will be able to reach that station with convenience and dispatch, and access to the financial district will also be facilitated.

In the meantime, as above stated, the Commission will be proceeding with the enlargement of the present Park street station. This enlargement will be so designed that it will be consistent, so far as practicable, either with making Park street the single terminus of the Boylston street subway, as at present required by chapter 741 of the Acts of 1911, or with making it only one of two termini.

The Commission, therefore, recommends that, at the present time, no further action be taken with reference to the determination of a permanent terminus or termini for the Boylston street subway.

Respectfully submitted,

THE BOSTON TRANSIT COMMISSION,
By GEORGE F. SWAIN,
Chairman.

APPENDIX B.

MODIFICATION OF THE CONTRACT FOR THE USE OF THE BOYLSTON STREET SUBWAY.

[*Authorized by Chap. 810, of Acts of 1913.*]

I.— This Contract made this twenty-ninth day of September in the year nineteen hundred and thirteen, by and between the city of Boston (hereinafter called the city), acting by the Boston Transit Commission (hereinafter called the commission), under and by virtue of an act of the Commonwealth of Massachusetts entitled "An act relative to the Boylston street subway," being chapter 810 of the acts of the year 1913 (hereinafter called chapter 810), and the Boston Elevated Railway Company (hereinafter called the company), and also the West End Street Railway Company joining in the execution hereof for the purpose hereinafter specified, witnesseth as follows:

II.— The contract dated December 7, 1911, heretofore made by and between the city acting by the commission under and by virtue of an act of the Commonwealth of Massachusetts entitled "An act relative to electric railway transportation facilities in the city of Boston and its vicinity," being chapter 741 of the acts of the year 1911, and the company, relative to the Boylston street subway, is modified as herein provided.

III.— Until the report required by section 1 of chapter 810 shall have been made by the commission and acted upon by the general court of the year 1914, the commission shall suspend the construction of that part of the Boylston street subway between Boylston and Park streets and also so much of the Boylston street subway westward of Tremont street as might be affected if the route of the subway should be altered as provided in section 1 of chapter 810. The commission shall proceed with the construction of the remainder of the Boylston street subway and shall connect it with the present Tremont street subway at some point in the vicinity of Park square; and upon its completion and connection and after reasonable time has been allowed for equipment by the company the said part of Boylston street subway shall be opened for operation without waiting for the construction of the portion of said subway of which the commission is authorized to suspend construction; and so much of the rental payable by the company under its said contract of December 7, 1911, as represents four and one-half per cent. (4½%) of the net cost of that part of the Boylston street subway which has been completed shall begin to accrue as soon as the use of that part of the Boylston street subway begins.

IV.— The commission may construct on Boylston street, between Arlington street and Charles street, a new incline and approach to the Tremont street subway to take the place of the present incline and approach in the Public Garden and may connect such incline and approach with the present Tremont street subway at some point in the vicinity of Park square. Upon the construction of such new incline the present incline and approach to the Public Garden shall be abandoned and the excavation therein shall be filled up, and the new incline and approach shall be deemed to be to all intents and purposes a part of the Tremont street subway. The cost of the new incline, and the cost of widening Boylston street, as authorized by section 3 of said chapter 810, but not including any payment for that part of the Public Garden which may be taken for that purpose, and including the cost of filling the excavation of the present incline to the Public Garden shall all be deemed a part of the cost of the Boylston street subway.

V.— This contract modifies the said contract of December 7, 1911, relative to the Boylston street subway only as herein expressly provided, and all provisions of said contract and of said chapter 741 of the acts of 1911 not expressly modified by said chapter 810 of the acts of 1913 and by this contract shall relate to and govern all acts and proceedings under authority of this contract.

VI.— The West End Street Railway Company joins in the execution of this contract solely for the purpose of expressing its agreement to the changes to be made in accordance with the foregoing provisions in the Tremont street subway leased to the West End Street Railway Company by the city, acting by the commission, by a contract dated December 7, 1896, which contract was assigned to the company under provisions in the lease from the West End Street Railway Company to the company, dated December 9, 1897, and upon the express condition that the said West End Street Railway Company shall not be put to or incur any expense by reason of any change in track or track equipment that may be made necessary by the substitution of said new incline and approach to the said Tremont street subway for the said incline and approach thereto now in the Public Garden, or by reason of any other change made necessary by anything else done under this contract, or any expense whatsoever in the premises; and the Boston Elevated Railway Company hereby agrees to hold said West End Street Railway Company harmless and indemnified from all such expense.

IN WITNESS WHEREOF the parties hereto and to three other instruments of like tenor and effect have set their hands and seals the day and year first above mentioned, the City of Boston acting by the Boston Transit Commission pursuant to vote of the commission, its members not being bound in their personal capacity, and the Boston Elevated Railway Company and the West End Street Railway Company acting by their respective presidents thereunto duly authorized.

CITY OF BOSTON acting by the BOSTON TRANSIT COMMISSION.
(Sgd) GEORGE F. SWAIN.
HORACE G. ALLEN.
JOSIAH QUINCY.
JAMES B. NOYES.
DAVID A. ELLIS.

BOSTON ELEVATED RAILWAY COMPANY.
By
[SEAL] (Sgd) WILLIAM A. BANCROFT,
President.

WEST END STREET RAILWAY COMPANY.
By
[SEAL] (Sgd) JOSEPH B. RUSSELL,
President.

Form of contract approved.
(Sgd) JOSEPH J. CORBETT,
Corporation Counsel.

At a regular meeting of the Boston Transit Commission held on October 23, 1913, the foregoing modification of lease being under consideration, it was

"*VOTED:* That the modification of the lease of the Boylston street subway in the form now under consideration be executed by the Commission in the name and behalf and under the seal of the City of Boston, and that as evidence thereof the same be signed by members constituting a majority of the Commission; said execution to take effect as of September 29, 1913."

Attest:
(Sgd.) B. LEIGHTON BEAL,
Secretary.

At a meeting of the Directors of the Boston Elevated Railway Company held September 29th, 1913, it was

"*VOTED:* That the President be and he hereby is authorized and instructed to execute in the name and behalf, and under the seal of the Company a contract with the City of Boston, acting by the Boston Transit Commission, and with the West End Street Railway Company, providing for the modification, as authorized by Chapter 810 of the Acts of the Commonwealth of Massachusetts for the year 1913, of the contract, dated December 7, 1911, heretofore made by and between the City, acting by the Boston Transit Commission, and the Company, relative to the Boylston street subway; such contract to be in the form submitted to this meeting with such modifications as the President shall approve."

A true copy.

Attest:

(Sgd) HENRY S. LYONS,
Clerk.

At a meeting of the Directors of the West End Street Railway Company duly called and held October 8, 1913, a quorum being present, it was

"*VOTED:* That the President be and hereby is authorized and instructed to execute in the name and behalf and under the seal of the Company a contract with the City of Boston, acting by the Boston Transit Commission, and the Boston Elevated Railway Company, in the form submitted to this meeting, providing for the modification, as authorized by Chapter 810 of the Acts of the Commonwealth of Massachusetts for the year 1913, of the contract dated December 7, 1911, heretofore made by and between the City, acting by the Boston Transit Commission, and the Boston Elevated Railway Company, relative to the Boylston street subway."

A true copy.

Attest:

(Sgd) PARKMAN DEXTER,
Clerk.

At a regular meeting of the Boston Transit Commission held on October 23, 1913, it was

"*VOTED:* That the Chairman be authorized to acknowledge the foregoing instrument in the name and behalf of the Commission to be the free act and deed of the City of Boston."

Attest:

(Sgd) B. LEIGHTON BEAL,
Secretary.

COMMONWEALTH OF MASSACHUSETTS.

SUFFOLK, ss. BOSTON, October 23, 1913.

Then personally appeared George F. Swain, Chairman of the Boston Transit Commission, and acknowledged the foregoing instrument in the name and behalf of said commission to be the free act and deed of the City of Boston.

Before me,

(Sgd) B. LEIGHTON BEAL,
Justice of the Peace.

APPENDIX C.

AGREEMENT FOR PURCHASE OF PROPERTY—AT WASHINGTON AND WINTER STREETS.

AGREEMENT made this second day of October, 1913, by and between the City of Boston, acting by the Boston Transit Commission,— its members not being bound in their personal capacity —party of the first part, and George A. Carpenter, of Wolfboro, in the State of New Hampshire, party of the second part.

The said City hereby agrees to sell and said Carpenter to purchase a certain parcel of land with the buildings thereon, situate on the south corner of Washington and Winter streets in said Boston, as taken by the said Boston Transit Commission, July 16, 1907, and described in a certain instrument dated July 16, 1907, and recorded July 18, 1907, with Suffolk Deeds, Book 3225, Page 321, excepting, however, and reserving forever to the City of Boston the easements, estates and rights in the portions or sections of said premises, all shown on a plan entitled "Boston Transit Commission, Plan Showing Space Reserved to the City of Boston in Estate Adjoining Washington Street, Winter Street and Jackson Place," dated October 2, 1913, signed by a majority of the Commission, and by the Chief Engineer of the Commission, numbered 11242 and to be recorded with the deed hereinafter referred to, in the Registry of Deeds for the County of Suffolk, and reserving further the right of suitable support, below the lower levels of said reserved portions or sections, by the soil or otherwise for existing structures or for those which may be constructed within the reserved portions or sections. Granting to the said owners of the premises, their heirs and assigns, a right of access to said premises for persons coming from the present Winter street station in the Washington street tunnel belonging to said City, such access to be through the entrance upon said premises substantially as such entrance now exists and as shown upon a plan entitled "Plan showing location of stairways and accesses from space reserved to the City of Boston in estate adjoining Washington street, Winter street and Jackson place," numbered 11263, dated October 2, 1913, signed by a majority of the Commission and by the Chief Engineer of the Commission and to be recorded with the deed hereinafter referred to in the Registry of Deeds for the County of Suffolk, and also granting to the said owners of the premises, their heirs and assigns a right of access to said premises for persons coming from the station to be constructed in Summer street between Washington and Arch streets as a part of the Dorchester tunnel now being constructed by said Commission for said City, such access to be through an entrance located upon said premises to be not more than eight feet wide and seven feet high in the clear and to be from the westerly side of a landing in a stairway leading from said proposed station in the Dorchester tunnel to the present station of the Washington street tunnel which landing, when and if constructed, is to be at elevation about 111.50 and about twenty feet from the westerly line of Washington street, such entrance to be substantially as shown upon said plan numbered 11263. Said entrances are at all times to be protected against fire, explosion or other sources of danger or annoyance or use for the purpose of entrance to said stations, by such orders, regulations, uses and appliances as the Boston Transit Commission or its successor in authority may from time to time deem requisite for the safety of those using said stations and for the proper operation of the railways in said tunnels. Granting to the said owners of the premises, their heirs and assigns, outside of the said reserved portions or sections, the right to the support on the upper surfaces of said portions or sections as at present of the building on said premises, and also the right at any time or times to alter, strengthen and rebuild the present or any future building on said premises, and for the support thereof to use the structures which may be placed within the above-described portions or sections, provided, that there shall be no obstruction or interference with the use of said portions or sections as herein reserved, or injury to the structures which exist or to those which may be constructed therein, by overloading or otherwise. The said owners of the premises, their heirs and assigns, are also permitted, subject to the approval of the Boston Transit Commission or its successors, the right to construct and maintain structures in accordance with the provisions of the building laws and regulations of the City of Boston, beneath the aforesaid portions or sections of the premises reserved to the City of Boston, provided, however, that the said owners of the premises, their heirs and assigns, shall construct and maintain at all times suitable support or supports for the existing structures or for those which may be constructed within the space reserved to the City of Boston. Providing, however, that no building shall be erected upon the premises and that no changes shall be made in any building upon said premises which might in any manner affect or endanger the structures of said City within said reserved portions or sections until the plans therefor are approved by the engineer of the Commission or, in the event of the termination of the existence of the Commission, by an engineer to be appointed by the Public Service Commission or its duly authorized successor in order to prevent any possible injury to present or future tunnel structures within the reserved space.

The said premises are to be conveyed by a sufficient deed giving a good and clear title thereto, free from all incumbrances excepting the reservations, conditions, provisions and stipulations above mentioned and excepting any taxes, water rates and assessments for the current city fiscal year. Said deed, duly executed, is to be deposited forthwith in escrow with the Treasurer of the City of Boston and is to be delivered by that official to said Carpenter upon and only upon complete and prompt payment and performance of each and every sum and agreement on his part to be paid and performed, or in the event of his failure to make any payment, or to perform any agreement on his part to be paid or performed when and as required herein, to be returned forthwith by said official to the said Boston Transit Commission. Title to the premises shall meanwhile remain in the said City of Boston and said Carpenter shall acquire no title therein until delivery to him of the deed aforesaid by the Treasurer of the said City of Boston.

The said City hereby agrees to accept and said Carpenter hereby agrees to pay to the party of the first part the sum of five hundred and eighty-seven thousand five hundred dollars ($587,500) in cash. One hundred thousand dollars ($100,000) thereof is to be paid upon the execution of these presents and the receipt thereof is hereby acknowledged. The balance thereof, four hundred and eighty-seven thousand five hundred dollars ($487,500) is to be paid on or before October 2, 1914, or if said Carpenter shall pay to the party of the first part another fifty thousand dollars ($50,000) of the principal thereof on or before October 2, 1914, and shall have fully and punctually paid and performed each and every sum and agreement by him to be paid and performed when and as required hereunder, the balance thereof, four hundred and thirty-seven thousand five hundred dollars ($437,500) is to be paid on or before October 2, 1915. Said Carpenter shall, also, pay to the party of the first part interest from and including October 2, 1913, at the rate of four (4) per cent. per annum, upon such part of the sum of four hundred and eighty-seven thousand five hundred dollars ($487,500) as remains unpaid. He shall pay the interest which has accrued up to April 2, 1914, upon that date and the interest accruing every six months thereafter, and at the time of final payment aforesaid whatever interest is then due. Said Carpenter shall, also, pay the party of the first part all taxes, water rates and assessments, proportionally adjusted from and including October 2, 1913, until final payment upon the land and the buildings thereon, as they now are or may hereafter be, during said interval, or, if owing to ownership by the City, taxes, water rates and assessments are not laid on the premises, a sum equal to the amount of the taxes, water rates and assessments which would have been payable on said premises had the ownership thereof been in an individual. He shall on April 2, 1914, and every six months thereafter, pay the proportional part of the taxes, water rates and assessments or the sum equal thereto above described up to that date and at the time of final payment aforesaid the proportional part of the taxes, water rates and assessments, or the sum equal thereto above described up to that date. He shall also at the time of final payment aforesaid pay the remainder of the taxes, and assessments or the sum equal thereto above described for the then current tax year of the City of Boston.

Full possession, subject to the exceptions and reservations aforesaid, of the said premises is hereby delivered to said Carpenter under this agreement and he shall be entitled thereto as long as, and only as long as, he fully and punctually pays and performs each and every sum and agreement by him to be paid and performed, when and as required hereunder. He shall forthwith raze the buildings now on said premises and forthwith erect a new building thereon which shall be more valuable than the buildings now existing on said premises, and shall maintain said premises in the same condition in which they then will be until final payment hereunder, reasonable use and wear of the buildings thereon and damage by fire or other unavoidable casualty excepted. The building now or hereafter situated on said premises shall, until the full performance of this agreement, be kept insured in a sum not less than eighty (80) per cent. of the value thereof by said Carpenter for the benefit of the party of the first part in form and in companies satisfactory to it.

Said Carpenter is to assume and perform all the duties to third persons and to the public which would be incumbent upon him if he were the owner of said premises, is to make no unlawful, improper or offensive use of the premises aforesaid during his occupancy thereof and is to exonerate, indemnify, and save harmless the party of the first part against all claims and demands arising out of any injury or accident to person or property in, on, or about the premises, against all expense, loss and damage occasioned by the use of said premises, or by any act done, or act or omission suffered in, on or about the premises aforesaid, against all claims and demands which, if unpaid, might become a lien or charge upon said premises, or any part thereof, against all liens and charges of every nature and character upon the said premises, or any part thereof, and against any claims or demands arising from any act or omission of said Carpenter, his agents, servants or employees, or from any act or omission of any contractor or sub-contractor by him directly or indirectly employed. He is also to furnish forthwith a bond in the penal sum of twenty thousand dollars ($20,000) with some Surety Company, satisfactory to the party of the first part, as surety thereon, to exonerate, indemnify and hold harmless the party of the first part from the various matters recited in this paragraph, if so requested at any time by the party of the first part, and in such form as said party of the first part may approve.

Provided, however, and these presents are upon the condition that, if said Carpenter neglects or fails to pay or perform promptly and fully, when and as required herein, any sum of money, or any agreement by him to be paid or performed, then the party of the first part may immediately or at any time thereafter, while such neglect or failure continues, and notwithstanding any license of any former breach of any of the agreements, terms or conditions herein, or any waiver of the benefit thereof in a former instance, without further notice or demand enter into and upon said premises, or any part thereof, in the name of the whole, and repossess the same as of its former estate; and upon entry as aforesaid all sums of money by said Carpenter paid to the party of the first part shall be forfeited, any and all buildings erected on the premises shall be and remain the sole property of the party of the first part, all rights herein of said Carpenter shall terminate and he shall be considered to all intents and purposes as holding possession of said premises without right so as to entitle the party of the first part to any existing or future remedies for recovering summary possession thereof, or the party of the first part may expel said Carpenter and all claiming under him and remove their effects forcibly, if necessary, without being taken or deemed guilty of any manner of trespass; and in either or any of the events aforesaid, said Carpenter shall be and remain liable to the party of the first part for all loss or damage incurred by the party of the first part, from any neglect or failure by said Carpenter to pay or perform promptly and fully, when and as required herein, any sum of money or any agreement by him to be paid or performed, or from any act or omission by said Carpenter hereunder.

Each and every payment, agreement, act and condition by said Carpenter to be paid, performed and complied with hereunder, when and as required herein shall, in the event of his death, be paid, performed and complied with, by his heirs, executors and administrators.

IN WITNESS WHEREOF the said parties have executed this instrument in triplicate on the day and year first above written.

(Sgd) GEORGE F. SWAIN,
JOSIAH QUINCY,
[SEAL] JAMES B. NOYES,
DAVID A. ELLIS,
} *Boston Transit Commission.*

(Sgd) GEO. A. CARPENTER (L. S.)

BOSTON, Mass., October 2, 1913.

The Boston Elevated Railway Company, in consideration of one dollar and other valuable considerations to it in hand paid by the party of the second part aforesaid, hereby assents to and approves of the agreement for certain rights of access above set forth.

IN WITNESS WHEREOF the Boston Elevated Railway Company has caused these presents to be signed in its name and behalf and its corporate seal to be hereto affixed by William A. Bancroft its President thereunto duly authorized.

BOSTON ELEVATED RAILWAY COMPANY.

(Sgd) BY WILLIAM A. BANCROFT, *President.*
(CORPORATE SEAL)

Approved as to form.
(Sgd) JOSEPH J. CORBETT,
Corporation Counsel.

APPENDIX D.

REPORT TO THE CITY COUNCIL ON COST OF EXTENDING WASHINGTON STREET TUNNEL.

BOSTON TRANSIT COMMISSION, 15 BEACON STREET,
BOSTON, November 13, 1913.

TO THE CITY COUNCIL OF THE CITY OF BOSTON, THOMAS J. KENNY, *President*.

GENTLEMEN,

Under date of October 20, 1913, your honorable body passed the following order:

"ORDERED: That the Boston Transit Commission be requested to furnish the City Council with estimates of the approximate cost of extending the Washington Street Tunnel to Grove Hall, and to Mattapan."

In compliance with this request I beg leave in behalf of the Transit Commission to submit the following report.

The cost of extending the Washington street tunnel to Grove Hall will of course depend upon the route selected. The Commission has had an approximate estimate made of the cost of such a tunnel, diverging from the Washington street tunnel at Eliot street, where said tunnel begins to ascend to the elevated structure, and thence proceeding under Washington street and under the steam railroad tracks to Dover street, thence crossing under private property to Harrison avenue, thence following the line of said avenue and other streets and avenues to Grove Hall and Mattapan. This route is indicated on the accompanying map and upon a superficial examination seems to be the most favorable route for such a tunnel. Eight stations have been assumed on this line, beginning with one at Dover street and including the terminal station at Mattapan.

The approximate cost of such a tunnel has been estimated by our Chief Engineer, Mr. E. S. Davis, as follows:

For construction	$14,470,000	
For land damages	60,000	
		$14,530,000

Similarly, Mr. Davis has estimated the approximate cost of a tunnel extending only to Grove Hall as follows:

For construction	$7,850,000	
For land damages	60,000	
		$7,910,000

The only land damages estimated in the above are those involved in crossing under private property from Washington street to Harrison avenue south of Dover street. It is to be remarked, however, that the construction of stations and the entrances thereto might involve additional land damages, perhaps of large amount.

We beg leave to call your attention once more to the fact that this is only an approximate estimate prepared by our Chief Engineer, no funds being available for making surveys, borings, or for other detailed studies which would be necessary for a more exact estimate.

A copy of Mr. Davis' report is appended.

Respectfully submitted,

(Sgd) GEO. F. SWAIN,
Chairman.

BOSTON TRANSIT COMMISSION, 15 BEACON STREET,
BOSTON, November 10, 1913.

Messrs. GEORGE F. SWAIN, HORACE G. ALLEN, JOSIAH QUINCY, JAMES B. NOYES, DAVID A. ELLIS,
Boston Transit Commission.

GENTLEMEN:

In compliance with your request, I submit an approximate estimate of the cost of extending the Washington-street Tunnel to Grove Hall and to Mattapan. The route on which the estimate is made begins at or near Kneeland street and follows under Washington street to a point a little south of Dover street; thence crosses various small streets and private property into Harrison avenue near Waltham street; thence in Harrison avenue to Dudley street; thence in Warren street to Grove Hall, and from there it continues in Blue Hill avenue to Mattapan; the total length being about 6.2 miles. The stations are located at or near the intersection of Washington and Dover streets, at or near the intersection of Massachusetts avenue and Harrison avenue, at or near Dudley street, at or near the intersection of Warren street with Townsend and Quincy streets, at or near Grove Hall, at or near the intersection of Blue Hill avenue and Talbot avenue (near Franklin Field), at or near the intersection of Blue Hill avenue and Morton street, and at Mattapan square.

At the proposed Dudley street station, connection can be made with the existing Dudley street station by passageways so constructed that passengers wishing to transfer to other routes may do so.

The estimated cost is:

Construction	$14,470,000
Land damages	60,000
Total	$14,530,000

If the tunnel should be constructed only to Grove Hall, a distance of about 3.3 miles, the approximate estimate of the cost would be:

Construction	$7,850,000
Land damages	60,000
Total	$7,910,000

It is assumed that the entrances and exits at the stations are to be in the streets. If private property should be taken for such entrances and exits the amount estimated for land damages should be increased.

The route by way of Harrison avenue, leaving Washington street south of Dover street, is chosen for the reason that it is about 185 feet shorter, and has a better alignment than a route continuing in Washington street to Dudley street. Construction of the last mentioned route would cost more. The elevated structure would have to be supported. There would be more serious interference with the street car and surface traffic, and increased liability of accidents in supporting the elevated structure, besides causing greater annoyance to the public.

The route is indicated on the Boston Directory map herewith, which has been given Boston Transit Commission number 11282, and a profile which has been given number 11283.

Respectfully submitted,

(Sgd). EDMUND S. DAVIS,
Chief Engineer.

APPENDIX E.

REPORT ON STATION AT BENNET STREET.

THE COMMONWEALTH OF MASSACHUSETTS.

BOSTON TRANSIT COMMISSION, 15 BEACON STREET,
BOSTON, Jan. 9, 1914.

To the Senate and House of Representatives.

Chapter 69, Resolves of 1913, reads as follows:—

RESOLVE TO PROVIDE FOR INVESTIGATING THE ADVISABILITY OF CONSTRUCTING A STATION FOR THE WASHINGTON STREET TUNNEL AT OR NEAR BENNET STREET IN THE CITY OF BOSTON.

Resolved, That the Boston transit commission shall investigate the desirability and practicability, and estimate the cost, of constructing a station for the Washington street tunnel in the city of Boston at or near Bennet street. The commission may give public hearings, if it deems them necessary, and shall report to the next general court on or before the tenth day of January.

In compliance with this resolve the Boston Transit Commission begs leave to report to the General Court of 1914 as follows: —

The commission has, in compliance with the resolve, investigated the desirability and practicability and estimated the cost of constructing a station for the Washington Street tunnel at or near Bennet Street. It has given one public hearing and another hearing upon request of interested parties.

The distance between Boylston Street station, the most southerly station in the Washington Street tunnel, and Dover Street station, the next station on the line to the south, is about 3,200 feet. Bennet Street is located between these two stations and is about 770 feet from Boylston Street and about 2,430 feet from Dover Street.

Proceeding southward from Boylston Street, the tracks in the tunnel, after passing under Eliot Street, begin to rise, so that at Bennet Street it was necessary in constructing the tunnel to raise the grade of the street. The grade of the tracks at Bennet Street is 5 per cent. This grade continues to the south, the tracks emerging entirely from the tunnel a short distance north of Oak Street, and from this point south, being carried on the elevated structure and passing over Oak and Pine Streets, Broadway and Noanet Street, and the tracks of the Boston & Albany Railroad Company and the New York, New Haven & Hartford Railroad Company. The grade becomes level a short distance south of Noanet Street and remains level across the railroad tracks and southerly along Washington Street toward Dover Street.

The consideration of the desirability and practicability of constructing a station at or near Bennet Street involves the following elements: — 1, physical practicability and safety of operation; 2, cost; 3, economic desirability from the traffic standpoint.

1. *Physical Practicability and Safety of Operation.*— As above explained, tracks in the subway at Bennet Street are on a 5 per cent. grade which continues for some distance to the south, but which gradually flattens toward the north. This is the steepest grade allowed on the Washington

Street line. There are serious objections to placing a subway station on such a grade. All trains would stop at this station, and northbound trains so stopping would be in danger of collision with trains coming from the south down the grade. In case a station were located at or near Bennet Street the Commission believes that it would be necessary to flatten the grade at this point, or else to locate the platforms of the station entirely to the north of Bennet Street, where the grade is not so steep.

If the station platforms were located entirely to the north of Bennet Street with entrances from said street, the southerly end of the platforms would be on a 5 per cent. grade and the northerly ends would be on a grade of slightly more than 2 per cent. From the operating point of view such a location would be much safer than any other which is practicable. If the station were so located, however, its northerly end would be only 264 feet distant from the southerly end of the Boylston Street station and about 600 feet from the southerly end of the Essex Street station platforms, so that trains going in either direction would hardly get under way before they would have to slow down for the next stop. It is estimated that to construct a station in this location would involve a total cost of about $340,000, including land damages.

If the station platforms were placed with Bennet Street near the center, it would be necessary, as above explained, to flatten the grade. If the grade were reduced even to 4 per cent. the point where the tracks would reach the full height of the elevated structure would be moved to the south, Oak Street would be closed to traffic on account of the lowering of the structure where it crosses that street, and the head room over Pine Street and over Broadway would probably have to be reduced. Furthermore, the level portion of the track extending from the junction with the Atlantic Avenue loop line south of the railroad tracks northerly would be reduced in length. If the grade at the station were made less than 4 per cent. the head room over the various streets to the south would be still more reduced. It is estimated that the cost of constructing a station having the center of the platforms at Bennet Street and with the grade reduced to 4 per cent. would be some $480,000, or considerably more than the estimated cost if the platforms should be entirely north of Bennet Street.

It would be a questionable policy from the point of view of safety of operation to recommend the placing of a station even on a 4 per cent. grade. While such a station might be operated for a long time without accident under proper rules and with proper signals, nevertheless, the commission does not consider it wise to place a station on such a grade if it can be reasonably avoided. This also is the view of the officials of the Boston Elevated Railway Company, whose experience in operation gives their opinion great weight. Furthermore, the commission believes it desirable to preserve the present length of level track on the elevated structure between the Castle Street junction and the incline.

2. *Cost.*— The expense of a station at Bennet Street would, as above stated, be from $350,000 to nearly $500,000 for construction and land damages. But in addition to this expense a station involves other elements of cost which should be considered, such as station operation, train wages, wear and tear, motive power and additional equipment.

The expense of operating the station is estimated by the Boston Elevated Railway Company at about $6,000 per annum. The cost of train wages is increased, because the introduction of a station involves a short delay, which in the aggregate amounts to a considerable loss of time. This is estimated by the Boston Elevated Railway Company at about $7,000 per annum. Wear and tear on rolling stock is increased because the introduction of a station means more stops and more wear of wheels, rails and brake shoes. This is estimated by the Boston Elevated Railway Company at about $2,200 per annum. Expense of motive power is increased because to stop and start a train requires more power than to keep it moving continuously. This element is estimated by the Boston Elevated Railway Company at about $5,200 per annum. Additional equipment may be fairly said to be called for if a station is introduced, on account of the considerable aggregate loss of time. This is estimated by the Boston Elevated Railway Company at about five cars, the interest, taxes and depreciation upon which would involve an annual charge of about $6,000.

It is not necessary to assume the entire correctness of the above estimates. That for station operation is probably close. Regarding the others there may be some differences of opinion. It is evident, however, that in addition to the actual cost of the station there would be an additional expense, which capitalized might easily amount to from $250,000 to $500,000, making the total cost of the station from $600,000 to perhaps $1,000,000. It is a serious question whether the conditions warrant the expenditure of such a sum.

3. *Economic Desirability from the Traffic Standpoint.*— As already stated, the station having platforms entirely to the north of Bennet Street would have its northerly end only 264 feet from the southerly end of the Boylston Street station. The distance from Bennet Street itself to the nearest entrance (on Lagrange Street) of the Boylston Street station is only about 780 feet for southbound trains and less than 1000 feet for northbound trains to the nearest entrance (on Washington Street) of the Essex Street station. If a station were located at Bennet Street the distance between the Bennet Street and Boylston Street stations would be smaller than between any other two stations on the line, even in the most congested parts of the city.

It is undoubtedly true that property owners in the neighborhood of Bennet Street would be benefited if a station were constructed at that point. The interests of the traveling public as a whole, however, must not be lost sight of and it must be remembered that on a rapid transit line the introduction of frequent stations involves a delay to thousands of through passengers. The Washington Street tunnel line was constructed to facilitate rapid transit to Dudley Street and Sullivan Square and the suburbs of the city beyond these points. Any question as to the introduction of a new station involves a balance of arguments bearing upon the interests of local property owners on the one hand, of through passengers on the other hand, and also a careful consideration of the question as to whether the cost is justified by the exigencies of the case or whether the money could be expended elsewhere to the better advantage of the traffic as a whole. If the elevated trains were the only means of reaching Bennet Street and adjoining portions of Washington Street the argument in favor of constructing a station at this point would be stronger. It must be remembered, however, that there are two tracks for surface cars throughout this portion of Washington Street, on which service is maintained.

Conclusions.— As a result of its study of this question the commission has arrived at the opinion that it is physically practicable to construct a station at or near Bennet Street, but that such construction is not desirable, and the commission does not recommend it.

In the first place, the commission does not believe that a subway station on a 4 per cent. grade is desirable, if it can be avoided, from the point of view of safety of operation, and it does not consider that any flattening of the grade at Bennet Street is desirable, because it would result in closing Oak Street to traffic and would diminish the length of level track just north of the signals at Castle Street junction.

In the second place, the cost of such a station, which (as above explained) would be from $350,000 to nearly $500,000 for construction and land damages, and probably from three-quarters of a million to a million dollars if the capitalized operating expenses are included, is not justified.

In the third place, a station at Bennet Street would be a very short distance from the existing station at Boylston Street, and the district in the neighborhood is already served by surface car lines in Washington Street. The distance of more than 3,000 feet between the Boylston Street station and the Dover Street station is greater than the distance between stations in Washington Street to the north, but on the other hand it is less than the distance between the stations at Dover Street and at Northampton Street.

It must be borne in mind that the object of the Washington Street tunnel is primarily to promote rapid transit between the suburbs and the congested center of the city. A station at Bennet Street would delay this traffic.

Appended to this report is the report of the chief engineer of this commission.

Respectfully submitted,

GEORGE F. SWAIN,
HORACE G. ALLEN,
JOSIAH QUINCY,
JAMES B. NOYES,
DAVID A. ELLIS,
Boston Transit Commission.

CHIEF ENGINEER'S REPORT.

BOSTON TRANSIT COMMISSION, 15 BEACON STREET,
BOSTON, Oct. 9, 1913.

Boston Transit Commission.

GENTLEMEN:— Referring to your instructions in regard to investigation as required by chapter 69 of the Resolves of 1913, "Resolve to provide for investigating the advisability of constructing a station for the Washington Street tunnel at or near Bennet Street in the city of Boston," I beg leave to submit some sketches made on blueprints of our record plans, showing a station having grades varying from 2.12 per cent. to 5 per cent. with its southerly end under Bennet Street, entrances to the station from Bennet Street, and platforms 350 feet in length:—

Estimated cost of construction, ...	$180,000
Land damages, ...	160,000
Total, ...	$340,000

The distance between the northerly end of this platform and the southerly end of the Boylston Street platform is about 264 feet.

This plan does not contemplate the change of grade of the tracks. I understand that the Boston Elevated Railway Company has made an estimate changing the grade to 4 per cent.

It is assumed that the provisions of this bill contemplated that the entrance to the station should be at Bennet Street. If the station were located so that one-half would be north of Bennet Street and the other half south of Bennet Street, the grades of the portion of the track where the cars would stop would vary from 4 per cent. to 5 per cent., and the difference in distance by the two schemes between what the public would have to go to reach their cars is very little. If the station were located with Bennet Street at its center and the track lowered to 4 per cent. grade, it would be necessary to lower the grade of Oak Street and of the elevated structure to a point south of Broadway, as indicated on the "Copy of sketch accompanying letter from C. S. Sergeant, vice-president, to F. E. Snow, Esq., and others, dated March 13, 1913." The estimate of cost of such a station as prepared by Mr. Fernald, first assistant engineer of the Boston Elevated Railway Company, is $480,000 (which seems to be reasonable), or $140,000 more than the estimated cost of the station as located with its southerly end in Bennet Street.

Yours respectfully,

EDMUND S. DAVIS,
Chief Engineer.

APPENDIX F.

REPORT ON TUNNEL TO CHELSEA.

THE COMMONWEALTH OF MASSACHUSETTS.

SPECIAL REPORT OF THE BOSTON TRANSIT COMMISSION, UNDER CHAPTER 78 OF THE RESOLVES OF 1913, RELATIVE TO THE CONSTRUCTION OF A TUNNEL AND SUBWAY BETWEEN THE CITIES OF BOSTON AND CHELSEA.

BOSTON TRANSIT COMMISSION,
15 BEACON STREET, BOSTON, Jan. 9, 1914.

To the Senate and House of Representatives.

Chapter 78, Resolves of 1913, reads as follows: —

RESOLVE RELATIVE TO THE CONSTRUCTION OF A TUNNEL BETWEEN THE CITIES OF BOSTON AND CHELSEA.

Resolved, That the Boston transit commission shall estimate the cost of constructing a tunnel and subway for the use of trolley cars, with a double track, between the city of Boston and the city of Chelsea. The commission shall report which would be the better route, in its judgment, either from the present subway in Haymarket square by the way of Charlestown, or from the present subway in Scollay square running under the harbor directly to the city of Chelsea, and shall state the probable cost of the tunnel and subway by each route and the feasibility of the construction thereof. The commission shall report to the general court on or before the tenth day of January, nineteen hundred and fourteen. The expense incident to the said investigation shall be borne equally by the city of Boston and the city of Chelsea.

In compliance with this resolve, the Boston Transit Commission respectfully submits the following report: —

The commission has studied various routes for a tunnel and subway between the city of Boston and the city of Chelsea, and submits on the accompanying map two routes which, in its opinion, would be better than any others.

Route A has at the Boston terminus a loop extending from Hanover Street under private property to Haymarket Square; thence under Sudbury Street connecting with the Scollay Square station; thence under Brattle Street, Brattle Square and private property to Hanover Street. The main subway extends under Hanover Street and under the harbor to Winnisimmet Square in the city of Chelsea.

Route B has a similar loop at the Boston end connecting with the Haymarket Square and Scollay Square stations, but the main subway extends under Washington Street, under the Charles River, the United States Navy Yard and the Mystic River to the same terminus at Winnisimmet Square at Chelsea.

Neither of these routes has any station between the two termini and either route appears to be equally feasible. Both routes are of almost exactly the same length,— route A being 2.5 miles long, the greater part under the harbor, and route B 2.49 miles long, largely under streets and government property.

The commission considers that, on the whole, route A is preferable. Either route would afford connections at Haymarket Square with the Washington Street tunnel and with the Tremont Street subway, and at Scollay Square with the East Boston tunnel and with the Tremont Street subway.

With reference to the feasibility of constructing the tunnel, the commission has had borings made in the harbor and finds that the character of the ground is mostly hard clay, similar to that which was met with in constructing the East Boston tunnel. There seems to be no question that either route is feasible.

With reference to the cost of such a tunnel, an approximate estimate indicates that the cost of either route would be as follows: construction about $6,000,000; land damages about $700,000; total $6,700,000. The bottom of the tunnel would be about 90 feet below mean low water.

The resolve does not ask the commission to express any opinion as to whether such a tunnel should be constructed. The commission would, however, respectfully call the attention of the General Court to the fact that under authority of chapter 741 of the Acts of 1911 the commission is now constructing the extension of the East Boston tunnel to Bowdoin Square and beyond. The East Boston tunnel is now being used with a stub-end terminal at the Boston end, and at the rush hour the number of cars run is very nearly equal to the capacity of the tunnel operated in this way. The extension which is now being built, with the loop at Bowdoin Square, will much increase the capacity of the tunnel, and will therefore afford an opportunity for a large increase in the traffic facilities between Boston, East Boston and Chelsea. By the route of this tunnel cars may reach Winnisimmet Square in Chelsea, the same point reached by the two routes direct to Chelsea. This extension is now being constructed as rapidly as possible, and it is hoped that it may be completed and put into operation in 1915.

Appended hereto is the report of the chief engineer of the commission.

Respectfully submitted,

GEORGE F. SWAIN,
HORACE G. ALLEN,
JOSIAH QUINCY,
JAMES B. NOYES,
DAVID A. ELLIS,
Boston Transit Commission.

REPORT OF CHIEF ENGINEER.

BOSTON, December 22, 1913.

Messrs. GEORGE F. SWAIN, *Chairman*, HORACE G. ALLEN, JOSIAH QUINCY, JAMES B. NOYES, DAVID A. ELLIS, *Boston Transit Commission.*

GENTLEMEN:— Referring to your instructions in regard to chapter 78 of the Resolves of the Legislature of 1913, I beg leave to submit the accompanying plans and profiles showing two alternate routes for a tunnel between Boston and Chelsea. By either route connections can be made at Haymarket Square with both the Washington Street tunnel and the Tremont Street subway, and at Scollay Square with the East Boston tunnel extension and again with the Tremont Street subway.

Route A, from Scollay Square in Boston to Winnisimmet Square in Chelsea, for the greater part is under the harbor, the total length being about 2.5 miles.

An approximate estimate of the cost for construction is about	$6,000,000
Land damages are estimated to be	700,000
Total,	$6,700,000

Route B from Haymarket Square follows Washington Street north to Charles River, thence under the river, under the easterly part of Charlestown and the mouth of the Mystic River to Chelsea, coming to the surface in Winnisimmet Square at the same place as shown by route A. The length of this route is about 2.49 miles.

An approximate estimate of the cost for construction is about the same as for route A, viz.,	$6,000,000
Land damages are estimated to be about	700,000
Total,	$6,700,000

Borings have been made to determine the character of the earth in which a tunnel would have to be constructed, which show the material to be mostly hard clay.

Other routes have been investigated for the portion in Boston to connect with the present subways and tunnels at Scollay Square and at Haymarket Square, but none of them seem to be as practicable, on account of grades, etc., as the ones shown.

Respectfully submitted,

EDMUND S. DAVIS,
Chief Engineer.

APPENDIX G.

REPORT ON REMOVING ELEVATED STRUCTURE IN WASHINGTON STREET AND CHARLESTOWN.

THE COMMONWEALTH OF MASSACHUSETTS.

REPORT OF THE BOSTON TRANSIT COMMISSION.

DEC. 31, 1913.

To the Senate and House of Representatives.

Chapter 84, Resolves of 1913, reads as follows:—

RESOLVE TO PROVIDE FOR AN INVESTIGATION RELATIVE TO THE REMOVAL OF THE ELEVATED STRUCTURE ON WASHINGTON STREET AND MAIN STREET IN THE CITY OF BOSTON AND THE EXTENSION OF THE WASHINGTON STREET TUNNEL TO DUDLEY STREET AND THE CONSTRUCTION OF A SUBWAY FROM CITY SQUARE TO SULLIVAN SQUARE IN SAID CITY.

Resolved, That the Boston transit commission is hereby authorized and directed to investigate and report to the general court on or before the first Monday in January, nineteen hundred and fourteen, in regard to the subject-matter of the petition of Louis Berenson, with the accompanying bill House, No. 1511, to provide for the removal of the elevated structure on Washington street in the city of Boston and on Main street in Charlestown, from City square to Sullivan square and for the extension of the Washington street tunnel beginning at the southerly end of said tunnel, thence running across or underneath public and private lands, thence continuing along Washington street to a point or points at, near or beyond Dudley street in said city, and connecting said subway or tunnel with the elevated structure at, near or beyond Dudley street and for the building of a subway from City square to Sullivan square in Charlestown. The said commission shall ascertain the probable cost of building the subway or tunnel between said points and the probable cost of the removal of the elevated structure, including any damages paid or payable by the Boston Elevated Railway Company to abutters under the provisions of chapter five hundred and forty-eight of the acts of the year eighteen hundred and ninety-four and of acts in amendment thereof and in addition thereto. The commission shall accompany its report with drafts of such bills as it shall deem necessary or suitable for carrying out the purposes of this resolve. The commission shall include in its report an estimate of the loss in tax valuations and taxes since the location, construction and maintenance of the elevated road on all property abutting on the elevated road between the points aforesaid, as well as on all property on streets leading to the street on which said structure is situated between said points. The commission shall also report the probable benefits to real estate owners and other persons as well as to the city of Boston, and shall estimate and report the probable increase in taxes to be paid upon the removal of the elevated structure and the construction of the tunnel between the points aforesaid. The commission shall give advertised public hearings on the subject-matter of this resolve, and may make such investigations, examinations, survey and plans as it shall deem necessary or proper. The commission may expend a sum not exceeding one thousand dollars in carrying out the provisions of this resolve, to be paid out of the treasury of the city of Boston.

In compliance with this resolve the Boston Transit Commission begs leave to submit the following report.

As provided by the resolve the commission gave an advertised public hearing on Sept. 19, 1913, and it has made such investigations and examinations as seemed desirable, to the extent which was possible under the small appropriation provided therefor.

House Bill No. 1511 is given in full as Appendix A of this report. Briefly stated, this bill and the resolve contemplate the possibility of removing the elevated railway structure now existing on Washington Street in Boston, between the southerly end of the Washington Street tunnel and Dudley Street, and on Main Street in Charlestown from City Square to Sullivan Square, replacing these structures by subways. It is not proposed to disturb the remaining elevated structures in the city, namely, the portion extending from City Square in Charlestown over the Charles River and into the Washington Street tunnel, the Atlantic Avenue loop from the Charlestown bridge to the corner of Castle and Washington streets, and the Forest Hills extension from Dudley Street, as well as the Cambridge viaduct.

Propositions similar to this one have been considered by previous Legislatures, and bills providing for the removal of the elevated structure were referred, by the General Court of 1909, to a Joint Board consisting of the Board of Railroad Commissioners and the Boston Transit Commission. This Joint Board reported on said bills to the General Court of 1910, and its report may be found in the sixteenth annual report of this commission.

There is undoubtedly a strong feeling on the part of certain abutters in favor of the removal of the elevated structures and the substitution therefor of subways. In order to understand the situation clearly, it seems desirable to review briefly the history of the development of rapid transit in Boston.

The first commission which was appointed to consider this subject, known as the Rapid Transit Commission, consisted of Nathan Matthews, Jr., John Quincy Adams, Chester W. Kingsley, Osborne Howes, Jr., Henry L. Higginson, James B. Richardson, John E. Fitzgerald and the late City Engineer William Jackson, and made its report April 5, 1892. At that time electric traction, even for street car lines, had not been fully developed. The electrification of the Boston street car lines was begun about Sept. 30, 1888, and was not completed until Sept. 30, 1896. The development of electric traction in a way which would permit the running of trains was first experimentally demonstrated at the Chicago Exposition of 1893, and was only rendered fully practicable by the invention of the multiple unit system in 1898, by which each car in a train could be made a motor car. At the time of the report of the Rapid Transit Commission, therefore, the use of subways or tunnels for urban traffic was not practicable on any extended scale. The only considerable use of these was in the metropolitan underground lines of London, operated by steam trains, creating conditions which were intensely disagreeable and even dangerous to health, on account of the smoke and gases.

The Rapid Transit Commission, therefore, recommended the improvement of the transportation system in Boston by the construction of elevated railways. They suggested two complete lines of elevated road, "the one from South Boston to Charlestown, and the other from Roxbury to Cambridge, the two lines being connected at Causeway and Eliot streets."

The line from South Boston to Charlestown was to run from City Point through East Fourth Street, West Broadway, Dorchester Avenue and Atlantic Avenue to Summer Street; thence either along Atlantic Avenue and Congress Street or along Federal Street to Post Office Square; thence over private property and through various streets and squares to the corner of Commercial and Cross Streets; thence through a widened Cross

Street to Haymarket Square; thence through Haverhill Street and over the Charles River to City Square in Charlestown; thence through Main Street to the neighborhood of Sullivan Square. A branch was provided for freight purposes from the corner of Commercial and Cross streets to Atlantic Avenue, terminating at about Hanover Street. The Roxbury route proposed extended from the neighborhood of Dudley Street through Washington Street to Waltham Street; thence through Waltham Street to Tremont Street; through Tremont Street to the corner of Chandler Street; thence in a new street to Park Square; thence over the Common to the neighborhood of West Street; thence through a subway partly under the Common and partly under Tremont Street, Scollay Square and Court Street to Bowdoin Square; thence again on an elevated structure to a relocated North Station and through Leverett Street and over the West Boston bridge to East Cambridge. Lines were also suggested from Bowdoin Square through Cambridge Street, over the Charles River and over Main Street to beyond Central Square in Cambridge; and along Charles Street between Park Square and Cambridge Street. These two through lines were to be connected by a line through Eliot and Kneeland streets.

It will be seen that these suggested lines were practically along the routes of the present elevated line from Dudley Street to Sullivan Square and along the route of the present Cambridge subway. They embraced, however, a more comprehensive system of elevated lines than these, and from our present point of view, and in the light of experience, it is on the whole fortunate that the recommendations in that report were not adopted.

Nothing was done under this report. Jan. 1, 1894, the Subway Commission was appointed, which, after carefully considering the subject and foreseeing the development of electric traction and the increasing use of subways, did not recommend any elevated railway line, but advised that a beginning should be made by constructing what is now known as the Tremont Street subway, extending from the Public Garden and from the Pleasant Street entrance to the North Station.

This recommendation of the Subway Commission met with violent opposition. People at that time were opposed to the use of subways, and did not realize the possibilities of electric traction. They did not see that the objections to the London underground roads would be overcome by its adoption, and probably it is safe to say that a very large majority of the people preferred elevated lines. An organization was formed to oppose the construction of the Tremont Street subway, and this organization in April, 1894, presented a petition to the Legislature praying that the subway should not be constructed, but that elevated lines should be substituted. The following is from a Boston newspaper of April 30, 1894: —

ANTI-SUBWAY OPPOSITION TO THE MAYOR'S UNDERGROUND ROUTE.

From the League organized for that purpose. Petition to the Legislature signed by thousands. A system of elevated roads is favored.

The executive committee of the Merchants' Anti-Subway League held a meeting Saturday. The business transacted was not given out for publication, but it is understood that the following petition, which has been in circulation during the past week or ten days, has been signed by some 12,000 merchants and citizens of Boston: —

To the Members of the General Court of Massachusetts.

We, the undersigned, citizens and taxpayers of Boston, many of us merchants and property owners in the so-called "congested district," hereby respectfully petition and represent that we are unalterably opposed to the construction of any subway in any portion of the city of Boston, whether for the alleged purposes of accommodating surface or elevated roads, or both, being convinced that such construction would seriously interfere with travel and traffic, proving ruinous to hundreds of merchants and in the end failing to relieve congestion or promote rapid transit.

And we declare ourselves in favor of some general system of elevated roads which shall accommodate the public, whether resident in the city proper or in Roxbury, Dorchester, Charlestown, East Boston, South Boston, Somerville, Brookline, Brighton or other suburb of Boston; said road to be constructed and operated by private capital instead of being a burden and a source of increased taxation, as would inevitably result under any of the proposed subway bills presented for your consideration.

And we shall ever pray.

This petition will be presented to the Legislature to-day. Following are the names of a few of the petitioners, from which it would appear that the sentiment of a large proportion of Boston's solid business men is against the subway and in favor of a general system of elevated roads.

(Here follow the names of 235 firms and individuals.)

In spite of this opposition, and largely through the efforts of Mr. Nathan Matthews, who was at that time mayor of the city, the construction of the Tremont Street subway was authorized, and the present Transit Commission was appointed to build and lease it. It was begun March 28, 1895, was first opened for operation to Park Street Sept. 1, 1897, and was finally completed and put into operation to the North Station Sept. 3, 1898. At about the same time an extensive system of elevated lines, embracing a total of about 74 miles, was being constructed in Chicago.

Since that time there has been a complete reversal of feeling with reference to the comparative advantages of subways and elevated lines, and it is probably safe to say that at present the preponderance of sentiment in favor of subways is as great as it was in favor of elevated lines twenty years ago. Each of these systems has advantages. Solely from the point of view of the traveler an elevated system is probably preferable, but from the point of view of the abutting property holder and of the general public it has many disadvantages. In general, it diminishes the value of property along the line, except for certain purposes, and the noise and the obstruction of light, as well as the obstruction to street traffic if the supports are placed in the street, are objectionable. Subways, on the other hand, tend to increase property values, and cause no permanent obstruction other than stairway coverings above ground.

As regards expense, however, even including damages paid to owners of abutting property, elevated lines are, in general, much less expensive than subways. The latter form the most costly means of urban transportation, and are, therefore, only economically justified where the traffic is very dense, or where there is a prospect of a very large increase of traffic which would not otherwise take place.

There is no doubt, therefore, that on the whole the popular preference in all of our cities is in favor of subways. Nevertheless, elevated railways have their proper place and are still being constructed where rapid transit is desired and where the large cost of a subway is not justified. Elevated lines in Philadelphia and in New York have been built within recent years, the line in Philadelphia having been opened in December, 1905, and extensions to the New York elevated system in the suburban districts having been opened yearly from 1901 to 1907.

In New York the present mileage of elevated structures is as follows: —

	Miles of Structure.	Track Miles.
Interborough Rapid Transit Company,	43.84	102.15[1]
NewYorkMunicipal Railways Corporation (B. R. T. Co.),	31.45	71.00
Total,	75.29	173.15

---

[1] Excluding yards.

There is to be built in Greater New York, as now approved by the Public Service Commission, the following additional mileage of elevated structures: —

In the Borough of Bronx,	15.96 miles of structure.
In the Borough of Queens,	14.01 miles of structure.
In the Borough of Kings,	25.66 miles of structure.
Total,	55.63 miles of structure.

Some of these are two-track, some three-track and some four-track, aggregating about 135 track miles; in other words, the total track miles of elevated structure now authorized in Greater New York is three-quarters of the total track mileage now existing.

Instead of tearing down elevated railway structures, the city of New York, therefore, is adding others.

This commission entirely appreciates the present preference for subways where they are economically justified. Whether it is now practicable or economical to remove any of the present elevated railway lines in Boston, with due regard to the rights of all the parties concerned, is quite another question, and cannot be decided simply on the basis of the advantages possessed by subways.

The present elevated lines in Boston were constructed under authority of chapter 548 of the Acts of 1894, as amended by chapter 500, Acts of 1897. It will be observed that the first act was passed at the time when the public preference was overwhelmingly in favor of elevated lines, and when a formal petition had been presented to the Legislature opposing the construction of the Tremont Street subway. This act incorporated the Boston Elevated Railway Company, and authorized that company to construct lines of elevated railway over certain specified routes. These routes included those on which the present elevated lines have been constructed and many others over which no elevated lines have been built, including practically all the routes suggested in the report of the Rapid Transit Commission of 1892. If any of the elevated lines now existing are objectionable, those who object to them may nevertheless congratulate themselves that such lines constitute but a small fraction of those which might have been constructed under authority of that act. The construction of the present lines was begun March 2, 1899, and the first public train put in operation June 10, 1901. As it was deemed impracticable to construct an elevated line in the narrow streets in the heart of Boston, chapter 500 of the Acts of the year 1897 permitted the elevated lines to connect with the Tremont Street subway, so that this subway formed a link in the through line from Dudley Street to Sullivan Square. This act made some further modifications in the locations for elevated lines granted to the Boston Elevated Railway Company. Subsequently, the elevated trains were removed from the Tremont Street subway and carried through the Washington Street tunnel, which was constructed under chapter 534, Acts of 1902, and opened Nov. 30, 1908.

The Boston Elevated Railway Company, therefore, acting under the authority granted to it by the Legislature, and at a time when elevated railways were preferred to subways, constructed its present system of elevated lines. It was required by chapter 500, Acts of 1897, to apply to the board of aldermen for a route of not less than four nor more than seven miles of double track, and to construct its railway over said route within three years after it was authorized so to do. These provisions were made before the opening of the Tremont Street subway. As required by law, the company paid damages to owners of property on the streets through which these lines were built, these damages amounting to large sums. The payments made to abutting owners between the southerly end of the Washington Street tunnel and Dudley Street, including an estimate for unsettled cases, amount to a total of $2,727,950; and the payments to abutters on Main Street, Charlestown, including an estimate for unsettled cases, amount to $803,766.82.

Under the foregoing statutes, the Boston Elevated Railway Company now owns its elevated structure, with the stations and appurtenant property and it has a permanent franchise to operate over them. It has paid damages to all owners of property, and in law these owners must be considered to have been fully reimbursed for any damage, present or future, which they may have sustained on account of the construction of these elevated lines.

Subsequent to the proceedings which have been described, other rapid transit lines, mostly subways, have been deemed necessary for the promotion of better transit in the city. These lines have been authorized by statute, some have been completed and others are under construction, and the Boston Elevated Railway Company has entered into contracts for the use of such lines at a definite rental. Nevertheless, it cannot be said that the era of elevated lines, even in Boston, is closed, for the Cambridge viaduct, extending over streets and private property from the North Station to Charles River and over the Charles River dam, was opened as late as June 1, 1912.

The financial aspect of this proposition, to remove certain elevated structures and substitute subways therefor, should first be made clear. The statement from the Boston Elevated Railway Company in Appendix B of this report gives full information with reference to the cost of its elevated structures, together with (as required by the resolve) the "damages paid or payable by the Boston Elevated Railway Company to abutters under the provisions of chapter 548 of the Acts of the year 1894 and of acts in amendment thereof or in addition thereto."

The following is a summary of these figures:—

1. Elevated structure on Washington Street between the Washington Street tunnel and Guild Street, including the elevated structure running to Tremont Street subway:—	
Cost of structure,	$2,131,296 00
Amount paid to abutting owners, including estimate for unsettled cases,	2,727,950 00
Amount paid for land taken, including incidental expenses less land and buildings no longer needed,	2,612,350 00
Total,	$7,471,596 00
2. Elevated structure on Main Street, Charlestown, between City and Sullivan squares:—	
Cost of structure,	$2,294,474 00
Paid to abutting owners,	803,766 82
Paid for land taken, including incidental expenses,	321,427 92
	$3,419,668 74
Total in South End and Charlestown,	$10,891,264 74[1]

These figures include the portion of the elevated structure from Dudley Street to Guild Street, as this portion would be rendered useless if the structure were removed up to Dudley Street. The Boston Elevated Railway Company has made this investment and is paying interest thereon.

The engineers of this commission have estimated the cost of substituting a subway for the present elevated structure, as follows:—

Between City Square and Sullivan Square, Charlestown:—	
For construction and land damages,	$4,312,000
From the southerly end of the Washington Street tunnel to a point near Dale Street, Roxbury:—	
For construction and land damages including connections with the Atlantic Avenue loop and with the Forest Hills extension,	8,920,500
Total cost of substituting subways for elevated lines,	$13,232,500

---

[1] If the elevated railway structure were taken by eminent domain the cost of such taking would have to include damages for disrupting the entire Boston Elevated Railway system by taking away from it one of its essential links, which would make the total far above this sum.

This sum, therefore, represents the expenditure which would be necessary to carry out the scheme proposed and upon which interest and sinking fund charges would have to be paid. This sum would be expended, not for the purpose of making any improvement in the transportation facilities of the city, which would remain practically the same as at present, but for substituting a subway line for an elevated line. The benefit of such a change would accrue mainly to the owners of abutting property, and, as above stated, these must be considered in law to have been already reimbursed in full for any damages, present or future, due to the construction of the elevated line. Some benefit would also accrue to the city as a whole by reason of such increase in real estate values as the change might produce.

The situation then is this. The elevated lines were constructed as a great public improvement designed to relieve a pressing and urgent public necessity for transportation, and it was decided by the Legislature that this necessity should be relieved in this particular way. Abutting property owners were paid their legal damages, but they now urge the replacement of the elevated lines by subway lines, which this commission estimates will cost $13,000,000.

In the report of the Joint Board which considered House Bills Nos. 1026 and 1026A, which were presented to the Legislature of 1909, will be found the opinion of the Attorney-General of the Commonwealth that these bills, which provided for the compulsory removal of certain elevated structures and the use by the company of a subway in substitution, were unconstitutional. His opinion is given as Appendix C of this report.

Clearly, then, the elevated structures cannot be removed, and the Boston Elevated Railway Company compelled to occupy and operate the subway in substitution therefor, except with its consent; and as it has assumed large burdens in contracting to lease the three new subways now under construction, it is unwilling to consent to anything which it believes will impair its transportation facilities or place additional financial burdens upon it. Mr. Berenson, the petitioner, at the hearing before the commission on the question under consideration, also expressed the opinion that no additional burdens should be imposed upon the company. He stated that he wished "to place them [the Elevated Railway] in no worse position than they are to-day."

Since, then, additional burdens cannot be placed upon the company without its consent, the expenditure of $13,000,000 involved in this project must be assumed by the city and borne by its taxpayers, whatever detailed plan might be proposed for carrying it into effect.

The question, therefore, is whether the city should assume this burden for the benefit of abutting property owners.

It has been suggested that the expenditure would be repaid for elevated railway purposes in three ways, viz.: first, from increased value of land now used which would be released or made more valuable; second, by the increase in real estate values and tax returns; third, by betterment assessments imposed upon abutting property as set forth in House Bill No. 1511.

The future value of lands which would be available for use if the elevated railway were discontinued and subways were substituted is entirely problematical. Small portions of estates which were taken for the construction of the elevated lines, if now released, might be worth but little, or might wait long before a purchaser could be found. The terminals at Roxbury and at Sullivan Square, however, if the terminal stations were placed under ground, would be entirely available for building purposes, subject to the underground easement. These terminals cost, according to the figures given in Appendix B, the sum of $721,427.92, which value, of course, includes the buildings previously existing thereon. How much these properties would be worth with the entire basement used for underground stations is very uncertain, but it would certainly be a small proportion of the total expense.

With reference to the increased value of real estate if the elevated structure should be removed, the resolve provides that "the commission shall include in its report an estimate of the loss in tax valuations and taxes since the location, construction and maintenance of the elevated road on all property abutting on the elevated road between the points aforesaid, as well as on all property on streets leading to the street on which said structure is situated between said points. The commission shall also report the probable benefits to real estate owners and other persons as well as to the city of Boston, and shall estimate and report the probable increase in taxes to be paid upon the removal of the elevated structure and the construction of the tunnel between the points aforesaid."

To comply adequately with this portion of the resolve alone would involve an expense far exceeding the limits of the appropriation made for this report. The commission has, however, endeavored to cover this subject so far as practicable, and for this purpose has employed the real estate firm of Meredith & Grew to investigate these questions and report thereon. Their report is given in Appendix D of this report.

In this connection also reference is made to City Document 80, 1909, regarding "Changes in assessed value of property on Washington Street, between Castle Street and Dudley Street, 1901–08," and City Document 133, 1912, relating to "Changes in assessed values of property along the elevated structure of Boston Elevated Railway."

A recapitulation of the first of these documents is as follows:—

Total value of property, easterly side of Harrison Avenue and Washington Street from Beach Street to Dudley Street, 1901,	$7,838,900
Total value of property, westerly side of Harrison Avenue and Washington Street, from Beach Street to Dudley Street, 1901,	7,410,500
Total value both sides for 1901,	$15,249,400
Total value of property, easterly side of Harrison Avenue and Washington Street, from Beach Street to Dudley Street, 1908,	$7,020,700
Total value of property, westerly side of Harrison Avenue and Washington Street, from Beach Street to Dudley Street, 1908,	6,585,700
Total value both sides for 1908	$13,606,400
Total value both sides for 1901	$15,249,400
Total value both sides for 1908,	13,606,400
Total decrease in value,	$1,643,000

The second of these documents is recapitulated as follows:—

I.	1909.	1912.	Gain.
Beach Street, Harrison Avenue and Washington Street to Dudley Street, southerly and easterly sides,	$8,932,800	$9,276,500	$343,700
Beach Street, Harrison Avenue and Washington Street to Dudley Street, westerly and northerly sides,	11,489,700	11,644,500	154,800
Total gain,	–	–	$498,500

II.	1901.	1912.	Gain.
Atlantic Avenue, Causeway Street and Main Street (Charlestown):—			
(a) Atlantic Avenue to Causeway Street, easterly side, ...	$13,995,700	$22,345,500	$8,349,800
Atlantic Avenue to Causeway Street, westerly side, ...	8,403,100	10,547,200	2,144,100
(b) Canal Street, westerly side, ...	776,600	992,800	216,200
(c) Main Street (Charlestown), easterly side, .	3,078,500	3,075,600	2,900 [1]
Main Street (Charlestown), westerly side, .	1,621,500	1,313,600	307,900 [1]
Total gain, ...	-	-	$10,399,300

[1] Loss.

III.	1907.	1912.	Gain.
Washington Street, Dudley Street to Forest Hills:—			
Washington Street, easterly side, ...	$1,977,500	$1,913,100	$64,400 [1]
Washington Street, westerly side, ...	2,149,000	2,237,400	88,400
Total gain, ...	-	-	$24,000
Grand total gain, ...	-	-	$10,921,800

[1] Loss.

It appears from these documents that between 1901 and 1908 there was a total decrease in values of $1,643,000 along Harrison Avenue and Washington Street, from Beach Street to Dudley Street; from 1909 to 1912, however, there was a gain on Beach Street, Harrison Avenue and Washington Street of $498,500. On Atlantic Avenue, Causeway Street and Main Street, Charlestown, between 1901 and 1912, there was a total gain in value of $10,399,300, the loss on Main Street, Charlestown, of $310,800, being offset by a gain on Atlantic Avenue and Canal Street of $10,710,100. On Washington Street, between Dudley Street and Forest Hills, between 1907 and 1912, although the elevated railway along this portion of Washington Street was opened on Nov. 22, 1909, there was not only no decrease in value, but there was a gain of $24,000.

A study of these figures, however, does not give any clear idea of the effect on real estate values of the construction of an elevated railway. Real estate values decrease or increase from a great variety of causes, of which the presence of an elevated railway is only one. In fact, the presence of such a road may increase rather than decrease values, according to the purpose for which the property is used, the traffic facilities, etc. The value of real estate in many parts of the South End had been decreasing long before the elevated railway was constructed, and if there has been a further decrease along Washington Street since the elevated lines were opened for traffic, we apprehend that a somewhat similar decrease would also be found to have occurred along Shawmut Avenue, Tremont Street, Columbus Avenue and other streets where no elevated railway exists.

What improvement in real estate values would follow the removal of the elevated structures is entirely problematical. Messrs. Meredith & Grew express the opinion that if the elevated structure were removed it would take many years for the district to recover. Their report further indicates that if the average tax rate for the last twelve years is applied to the total estimated decrease in property values on Washington Street, and on Main Street in Charlestown, the loss in annual revenue to the city from taxes would amount to but $47,553, which would be but a drop in the bucket as compared with the annual expense involved in the expenditure of $13,232,500.

Even if it were legally possible to secure some return on the investment by assessing betterments on abutting property owners, such a plan appears to the commission quite impracticable, and any betterments which could be secured would, in the opinion of the commission, amount to but a very small part of the total cost of the scheme.

With respect to the physical possibility of carrying out the plan proposed, it is of course possible to construct the subways and connections and to remove the elevated structures. Very serious difficulties, however, present themselves, particularly with respect to making suitable connections between these new subways and the elevated lines at Castle Street, beyond Dudley Street and Sullivan Square and on the Charlestown bridge. Indeed, these physical difficulties alone, together with the grades introduced, would seem in themselves to justify considering the project as economically impracticable. It does not seem practicable, for instance, to descend from the Charlestown bridge on the north without seriously injuring City Square, closing several streets, and taking a large amount of property for the incline. Indeed, such a plan would apparently work havoc in this portion of Charlestown. Similar difficulties present themselves at the other points mentioned. To connect the Atlantic Avenue line with a new subway in Washington Street would be very expensive, and would involve closing several of the streets which extend between Harrison Avenue and Washington Street from Castle Street to Dover Street, as well as the taking of a large amount of private property on the easterly side of Washington Street. At Dudley Street, also, the connections with the elevated lines beyond would be difficult and expensive. The commission has not had the time, nor has it considered it necessary, to investigate thoroughly all of these difficulties. The engineering studies requisite for such an investigation would be extensive, and the small appropriation authorized by the resolve under which this report is made is entirely insufficient therefor. Further, this appropriation was not made by the City until Oct. 31, 1913.

As a result of the study which it has given to this matter in compliance with the resolve, the commission has, therefore, arrived at the following conclusions: —

First.— An elevated structure is undoubtedly objectionable from a physical point of view, and it has a tendency to decrease property values for certain purposes. The elevated lines in Boston, however, were constructed at a time when there was an overwhelming popular preference for such lines as compared with subways. They were built for the purpose of promoting rapid transit between the center of the city and suburban districts. While they have undoubtedly decreased the value of property along some of the streets through which they run, the law provided that property owners should be fully compensated for this injury, and the resultant good to the community, accomplished by these lines in promoting metropolitan traffic, must be assumed to have been considered by the Legislature, which authorized these lines, as outweighing any disadvantages which they might involve.

Second.— To substitute subways for elevated lines within the points specified in the resolve would involve a very large expense, estimated approximately at $13,232,500. This expenditure would not increase the transit facilities and would have to be assumed by the city.

Third.— While the removal of the elevated structure might be expected to increase property values along some parts of the line, such increase, in the opinion of competent real estate experts, would not be rapid, and even if such increase were sufficient to equal the decrease in value which has resulted from the presence of the elevated structure, the increase in taxes resulting therefrom would be but a very small percentage of the annual expense involved in making the change.

Fourth.— Property owners along the elevated lines must in law be considered to have been fully recompensed for any injury caused to them by the construction of the elevated railway. While their property would probably be increased in value by the removal of the elevated structure, the commission knows of no legal and practicable way by which any substantial return in the way of betterments could be obtained from them. Considering the doubtful increase in taxable property, the commission, therefore, knows of no way in which the city could be reimbursed for any such outlay as would be required by the project under consideration. For this reason the commission has not attempted to draw up any specific bill.

While the commission fully appreciates the disadvantages of elevated structures in public streets, the fact must be recognized that they are in many cases the only practicable means of securing rapid transit facilities, and that, if authorized by the Legislature, the benefits accruing from such facilities to the public at large must be assumed to be greater than the injury suffered by any individuals. Elevated railways exist in many cities, and while their defects are generally recognized, the commission knows of no instance in which elevated structures of any extent have been removed because of their objectionable features and subways substituted therefor. All subways built in cities already having elevated railways have been constructed for the purpose of furnishing additional facilities, and have not been in substitution for elevated lines. It cannot be too clearly borne in mind that the project contemplated in this resolve involves no additional transit facilities, but simply contemplates a large expenditure to substitute subways for elevated lines, giving the same accommodations to the public and benefiting only a comparatively small number of property owners at the expense of the whole community.

Appended is the report of the chief engineer of this commission (Appendix E).

Respectfully submitted,

GEORGE F. SWAIN,
HORACE G. ALLEN,
JOSIAH QUINCY,
JAMES B. NOYES,
DAVID A. ELLIS,
Boston Transit Commission.

APPENDIX A.

HOUSE, No. 1511.

AN ACT TO PROVIDE FOR THE EXTENSION OF THE WASHINGTON STREET TUNNEL IN THE CITY OF BOSTON.

Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same, as follows:

SECTION 1. The present Washington street tunnel used by the elevated railroad in the city of Boston shall be extended by the Boston transit commission, or such other board or authority as shall be charged with such construction, to a point beyond Dudley street, under the same provisions as to construction, payment and use as provided by law for the construction, payment and use of the said present tunnel.

SECTION 2. The elevated structure now in said Washington and connecting streets used in connection with the present tunnel shall, on the construction of the extension of the tunnel hereinbefore provided for, be removed, the expense thereof to be considered a part of the cost of construction of said extension.

SECTION 3. Upon the carrying out of the provisions aforesaid, the superior court for the county of Suffolk upon petition of the city, company or any party in interest shall appoint three commissioners who shall determine the damages, if any, sustained by the company over and above the benefit, if any, the company received by the carrying out of said provisions, and the damages so determined shall be paid by the city and considered a part of the cost of said extension; the commissioners shall within three years after the carrying out of said provisions determine the benefits, if any, received by the several parcels of real estate abutting on the parts of the streets from which said structure shall have been removed and assess upon each such parcel a betterment consisting of a proportionate part of not exceeding one half the cost of carrying out said provisions and not exceeding one half the benefit received by the parcel.

SECTION 4. The owners of parcels so assessed shall pay to the city each year one twenty-fifth of the amount assessed on such parcel, (with interest at four per cent per annum) on the part of the assessment remaining unpaid, and the amount of the rental to be paid by the company shall be reduced by the total amount of the assessments paid during the year; any owner may pay the whole or the balance of his assessment and in such case the city shall hold the same and use one twenty-fifth thereof each year in reduction of the rental.

SECTION 5. If any party in interest is dissatisfied with the determination of the commissioners, he or it may have damages or betterments determined by a jury or justice of said court on petition therefor filed in said court within one year after the determination; and all acts and all laws relating to the determination of damages and betterments for laying out highways in said city shall so far as applicable govern in such matters under this act.

APPENDIX B.

BOSTON, MASS., Sept. 18, 1913.

Mr. F. E. SNOW, Messrs. GASTON, SNOW & SALTONSTALL, *Shawmut Bank Building, Boston, Mass.*

DEAR SIR:— As requested by your Mr. Ballantine, I send you the following approximate costs of the portions of our elevated structure and equipment to be considered under chapter 84 of the Resolves of 1913 (exclusive of real estate and abutters' damages and surface car tracks in elevated stations and inclines, including connections with surface car tracks in streets).

Washington and Castle streets to Tremont Street subway,	$171,251
Washington and Castle streets to Washington Street tunnel,	99,900
Washington Street, Castle to Dudley streets, . . .	1,653,620
Washington Street, Dudley to Guild streets, . . .	206,525
	$2,131,296
Main Street, City Square to Sullivan Square . . .	$2,294,474

Yours very truly,

C. S. SERGEANT,
Vice-President.

SCHEDULE.

Washington Street.

Amounts paid to abutting owners between the southerly end of the Washington Street tunnel and Dudley Street:—	
Paid to abutting owners (partly estimated), ...	[1] $2,545,527 62
Estimate for unsettled abutting cases, ...	182,422 38
Paid for land taken and consequential injury to estates caused by partial takings, construction of the railway and change of grade of streets, southerly end of Washington Street tunnel to Castle Street, ...	992,395 99
Estimate for unsettled cases, ...	17,604 01
Land corner Castle and Washington streets, . . .	70,000 00
Land corner Washington and Motte streets and Harrison Avenue, ...	188,850 00
Roxbury terminal lands and consequential injury, . .	525,000 00
Estimate of incidental expenses incurred and to be incurred in the preparation for trial, trial and settlement of these cases, ...	400,000 00
Paid for land taken and consequential injury and estimate of incidental expenses, Pleasant Street to corner Castle and Washington streets, ...	480,000 00
	$5,401,800 00
Less land and buildings between southerly end of the Washington Street tunnel and Castle Street no longer needed for railway purposes; value estimated at, . .	241,500 00
	$5,160,300 00
Amounts paid to abutting owners, Dudley Street to Guild Street,[1] with estimate of incidental expenses and damages paid and to be paid for alterations and additions,	$180,000 00

Main Street.

Payments to abutters, ...	$773,766 82
Estimate for unsettled cases, ...	30,000 00
Cost of land taken for terminals and consequential injury,	196,427 92
Estimate of incidental expenses incurred and to be incurred in preparation for trial, trial and settlement of these cases, ...	125,000 00
	$1,125,194 74

APPENDIX C.

DEPARTMENT OF THE ATTORNEY-GENERAL,
BOSTON, DEC. 6, 1909.

Hon. W. P. HALL, *Chairman*, Hon. GEORGE F. SWAIN, *Secretary, Joint Board.*

GENTLEMEN:—The Joint Board acting under the provisions of chapter 94 of the Resolves of 1909, and consisting of the Board of Railroad Commissioners and the Boston Transit Commission, asks my opinion with respect to the constitutionality of House Bills No. 1026 and No. 1026A.

House Bill No. 1026 is as follows:—

SECTION 1. The present Washington street tunnel used by the elevated railroad in the city of Boston shall be extended by the Boston transit commission, or such other board or authority as shall be charged with such construction, to a point beyond Dudley street, under the same provisions as to construction, payment and use as provided by law for the construction, payment and use of the said present tunnel.

---

[1] Several cases within this section were settled with other cases not within the section for a lump sum, requiring an apportionment by estimate.

SECTION 2. The elevated structure now in said Washington and connecting streets, used in connection with the present tunnel, shall on the construction of the extension of the tunnel hereinbefore provided for be removed, the expenses thereof to be considered a part of the cost of construction of said extension.

The proposed bill, numbered 1026A, in sections 1 and 2 is identical with House Bill No. 1026. Section 3 is as follows:—

> Upon the carrying out of the provisions aforesaid, the superior court for the county of Suffolk, upon petition of the city, company, or any party in interest, shall appoint three commissioners who shall determine the damages, if any, sustained by the company over and above the benefit, if any, the company receives by the carrying out of said provisions, and the damages so determined shall be paid by the city and considered a part of the cost of said extension; the commissioners shall within three years after the carrying out of said provision, determine the benefits, if any, received by the several parcels of real estate abutting on the part of the streets from which said structure shall have been removed, and assess upon each such parcel a betterment consisting of a proportional part of the cost of carrying out said provisions, but the total amount of the betterments assessed shall not exceed one half of such cost, and no betterment shall exceed one half of the benefit received by the parcel.

Section 4 provides:—

> The owner of each parcel so assessed shall pay to the city each year a part of the betterment, consisting of one twenty-fifth of the amount assessed on the parcel, and the rental to be paid by the company shall be reduced by the total amount of said parts to be paid during the year; any owner may pay to the city the whole or the balance of his betterment, and in such case the city shall pay his part aforesaid.

Section 5 provides:—

> If any party in interest is dissatisfied with the determination of the commissioners, the damage or betterment may be determined by a jury or a justice of said court on petition therefor filed in said court within one year after the determination; and all laws relating to the determination and payment of damages and betterments for laying out highways in said city shall so far as applicable govern in such matters under this act.

To accomplish the purpose of these bills, if enacted, by requiring the Boston Elevated Railway Company to abandon its present elevated structure in Washington Street, and to operate its trains in and through a new subway to be constructed thereunder as provided in such bills, it is obvious that the Legislature must invoke one of three powers:—

1. The reserved power to amend the charter of all corporations organized since 1831;
2. The police power; or
3. The power of eminent domain;

and that such purpose must justify the exercise of the power so invoked.

1. THE RESERVED POWER TO AMEND THE CHARTER OF THE BOSTON ELEVATED RAILWAY COMPANY.

The reserved power in the Legislature to amend or repeal the charter of any corporation is derived from statutes of which the present form is to be found in R. L., c. 109, § 3, which is as follows:—

> Every act of incorporation passed since the eleventh day of March in the year eighteen hundred and thirty-one shall be subject to amendment, alteration or repeal by the general court. . . .

The power so reserved, however, is not without limitation, and cannot be constitutionally invoked to work a forfeiture or confiscation of property legally acquired and owned by the corporation, or to abrogate a contract established by the terms of its charter and duly performed by it. Commonwealth *v.* Essex Co., 13 Gray, 239; Woodward *v.* Central Vermont Railway Co., 180 Mass. 599. See also Parker *v.* Metropolitan R.R. Co., 109 Mass. 506; Attorney-General *v.* Old Colony R.R. Co., 160 Mass. 62.

The Boston Elevated Railway Company was chartered under St. 1894, c. 548, as amended by St. 1897, c. 500, and was authorized by section 6 of the former statute, as amended by section 2 of chapter 500 of the Acts of 1897, to —

> construct lines of elevated railway according to such plans or systems as the board of railroad commissioners may approve, to be operated by electricity or other motive power except steam, upon the following locations, and may equip, maintain and operate engines, motors and cars thereon, to wit:—

Then follow certain specific locations. Section 10 of chapter 500 is as follows:

> Said corporation may establish, and take a toll or fare, which shall not exceed the sum of five cents for a single continuous passage in the same general direction upon the roads owned, leased or operated by it; and this sum shall not be reduced by the legislature during the period of twenty-five years, from and after the passage of this act: . . . During said period of twenty-five years no taxes or excises not at present in fact imposed upon street railways shall be imposed in respect of the lines owned, leased or operated by said corporation, other than such as may have been in fact imposed upon the lines hereafter leased or operated by it at the date of such operating contract or of such lease or agreement hereafter made therefor nor any other burden, duty or obligation which is not at the same time imposed by general law on all street railway companies: . . .

This section has been held to constitute a contract between the Commonwealth and the corporation, by which for a period of twenty-five years the corporation was to pay a fixed tax or compensation for the privileges granted by the act, "and for the use and occupation of the public streets, squares and places, by the lines of elevated and surface railroad, owned, leased and operated by it," and for such period was not to be made subject to any burden, duty or other obligation which was not at the same time imposed by general law upon all other street railway companies. See II. Op. Atty.-Gen., 426, 427; II. Op. Atty.-Gen., 261.

Section 19 of chapter 500 is as follows:—

> The locations of or right to maintain any elevated lines or structures of the Boston Elevated Railway Company shall not be subject to revocation except in the manner and on the terms prescribed in sections seven and eight of chapter one hundred and twelve of the Public Statutes: *provided, however*, that any location upon which said corporation has not constructed its railroad within ten years from the passage of this act shall be subject to revocation by the legislature; but no location upon which said corporation has begun the construction of its railroad within said period shall be subject to revocation if the same be completed within three years thereafter.

St. 1902, c. 534, is entitled "An Act to provide for the construction of additional tunnels and subways in the city of Boston," and provided for the construction by the Boston Transit Commission of —

> a system of tunnels and subways so designed as to be adapted for the accommodation of two tracks especially for use by elevated cars or trains and two tracks especially for use by surface cars. [Section 1.]

Section 10 provides that:—

> The commission shall within ninety days after the passage of this act execute with the company [the Boston Elevated Railway Company], in the name of the city, the company consenting thereto, a contract in writing for the sole and exclusive use of the tunnel and subway and appurtenances for the period of twenty-five years from the beginning of the use of the tunnel, at an annual rental equal to four and one-half per cent of the net cost of the tunnel and subway respectively, for the running of trains and cars therein, and for such other uses and upon such provisions and conditions, not affecting the term or rental, as the commission and the company may agree upon, or in case of difference, as the board may determine. The provisions of this act, in so far as they declare, define or establish the terms and conditions for the construction, tenure, maintenance and operation of said tunnel, subway and appurtenances, shall be embodied in and made part of said contract. . . .

Section 11 is in part as follows:—

> If the company shall execute the contract hereinbefore provided for, the company may, before the completion of the tunnel, construct lines of elevated railway according to such plans as the board may approve, to be operated by electricity or by such other motive power except steam, as may be approved by the board in respect of the locations heretofore granted to the company, upon the following locations, which are hereby granted therefor, and may equip, maintain and operate engines, motors, trains and cars thereon, to wit:— (*a*) beginning at the southerly end or ends of the tunnel, thence upon and over any streets and public or private lands to the company's elevated structure now erected on or near Washington, Motte or Castle streets; . . .

These acts, in my opinion, clearly constitute a contract between the Commonwealth and the Boston Elevated Railway Company with respect to the locations granted, which is to endure so long as such company shall have the use of the tunnel under the contract with the city of Boston, provided for therein, and which cannot be altered or abrogated by amendment without the consent of the company without violating section 10 of Article I of the Constitution of the United States, which prohibits the passage by a State of any law impairing the obligation of contracts. See New Jersey *v.* Yard, 95 U. S. 104.

It follows, therefore, that the purpose of the proposed bills cannot constitutionally be accomplished by means of an amendment to the charter of the Boston Elevated Railway Company without the assent of that company to its terms and provisions.

2. THE POLICE POWER.

The police power, as exercised by the Legislature, is defined in Commonwealth *v.* Bearse, 132 Mass. 542, 546, as extending "to all matters which concern its internal regulation." Under this power the Legislature may regulate the operation of railroads, may alter their location, or may provide that at their own expense they shall eliminate a crossing at grade, with highways or other public means of communication, when public necessity or convenience so require. See Roxbury *v.* Boston & Providence R.R., 6 Cush. 424; Commonwealth *v.* Eastern R.R., 103 Mass. 254; *In re* Mayor, etc., of Northampton, 158 Mass. 299. And this, it would seem, may be done without regard to the reserved power of amendment. Norwood *v.* New York, etc., R.R., 161 Mass. 359, 265, and cases cited.

This power is not lost because its exercise may impair obligations of contracts either between third parties or between the sovereign and the corporation affected. See Butchers' Union Co. *v.* Crescent City Co., 111 U. S. 746, and cases cited.

I am of opinion, therefore, that under the police power the Boston

Elevated Railway Company might be required at its own expense to remove its elevated tracks from Washington Street, notwithstanding the existence of a contract between such corporation and the Commonwealth, and of a further contract between such corporation and the city of Boston, represented by the Transit Commission. Such a regulation, however, must be grounded upon a legitimate public advantage to be derived therefrom, and the courts will interfere if rights of property are invaded under the guise of police regulation. See Commonwealth *v.* Bearse, *supra.*

In the present instance the question would seem to be whether or not any sufficient public benefit would accrue from the removal of the elevated structure upon the Washington Street location. It is to be observed that since the enactment of St. 1894, c. 548, it has been the policy of the Legislature to permit the construction of elevated structures in the streets of the city of Boston where the need of public transportation calls for further facilities, and that such structures are no longer to be regarded as nuisances within such streets. The Legislature frequently authorizes and legalizes the maintenance of structures in the streets which would otherwise be nuisances. See Commonwealth *v.* Boston, 97 Mass. 555; Lincoln *v.* Commonwealth, 164 Mass. 374.

The very structure which the proposed bills seek to remove was specifically authorized by the Legislature, and it must be assumed that in conferring authority upon the company it was familiar with the conditions obtaining upon the location granted, and had weighed and determined the several means of serving the public necessity and convenience at that point. In view of this consideration by the Legislature, it would be necessary, in my opinion, that evidence should be offered tending to show a substantial change in the conditions attending the public use of the streets in which locations were granted since the passage of the act, by which the public safety, health or convenience were seriously interfered with by the continued maintenance of an elevated structure. No such changed condition has been shown as, in my opinion, would warrant a conclusion that the Legislature's point of view could reasonably have changed since the passage of the acts aforesaid. It would seem to follow, therefore, that after the Boston Elevated Railway Company had acted upon due authority from the Legislature, and had expended money for land damages and for the erection of an elevated structure, upon the faith of an enactment by which such structure was legalized, should the Commonwealth reconsider its act and declare such a structure a nuisance, and require its removal without compensation, such action would be unjustifiable under the police power, and would amount to a confiscation of property, provided it did not appear that there was any material change in the public use of the streets in which such structure was erected to justify it.

Another objection to the proposed bills is that they assume to impose upon the company a contract with the city of Boston which apparently the company is to have no opportunity to decline, since they provide that the proposed tunnel shall be constructed and used "under the same provisions as to construction, payment and use as provided by law for the construction, payment and use of said present tunnel." While these bills are not particularly clear, it may be fairly gathered from section 1 that no choice is to be left to the company, and that such company is required to occupy a tunnel, when constructed, upon the same terms and conditions as those established by law for the occupation of the present tunnel in Washington Street, which would include an existing contract between the company and the Boston Transit Commission on behalf of the city. This, it seems to me, could not be done under the police power, since to require the company to descend into the tunnel and to pay rent therefor upon terms and conditions established by another contract entered into for the use of another part of the tunnel, would amount to a taking of the property of the company without due process of law.

3. THE POWER OF EMINENT DOMAIN.

It would seem that there can be no doubt that the structure in Washington Street might be taken by eminent domain and due compensation given therefor, and House Bill No. 1026A, in sections 3 and 5, appears to contemplate a taking by eminent domain, with a final appeal to a jury. The bill is loosely drawn, and it is difficult to determine the exact effect of its provisions, and I shall assume that it has provided for a taking, with a proper recourse to the courts for the determination of damages. The bill does not in terms provide for any compensation for the contract subsisting between the Commonwealth and the company in respect to the Washington Street location, but it provides for the payment of damages, if any, to the company, and this provision would doubtless include damages occasioned by the interruption to such contract. The same provision would probably also include any damages which might accrue from the diminished consideration for the contract which the company now has with the Transit Commission.

The proposed bills, however, both contemplate the construction of a tunnel and its occupation by the Boston Elevated Railway Company, payment for such occupation and use to coincide with the terms and conditions upon which the existing tunnel in Washington Street was constructed and is now occupied under the contract with the Transit Commission above referred to, which contract is not before me. It seems to me that such requirements do not properly fall within the field of the power of eminent domain. Under that power property may be taken upon sufficient payment, but I am not aware of any case in which under such power an attempt has been made to make the volition of a corporation — its freedom to do or not to do any particular act or acts — the subject of a taking; and I am therefore clearly of the opinion that so much of these proposed acts as assumes to require the company to occupy and use a new tunnel upon terms and conditions now fixed by law or by contract with relation to an existing tunnel, can be justified only under the police power, which has been elsewhere referred to.

Very truly yours,

DANA MALONE,
Attorney-General.

APPENDIX D.

BOSTON, Oct. 16, 1913.

The Boston Transit Commission, 15 Beacon Street, Boston, Mass.

GENTLEMEN:— *In re* the Elevated Railway on Washington Street between Castle and Dudley streets, and on Main Street in Charlestown as far as Sullivan Square, we beg to submit the following data:—

WASHINGTON STREET.

We find that there has been a decrease in the assessors' valuations of estates abutting on Washington Street from Castle Street to Dudley Street, between 1901 and 1912, of $1,235,600. In the former year the total valuation was $12,858,000, and in the latter year $11,622,400, or about 9.5 per cent. decrease.

As to the variation in assessors' valuations of properties on streets leading to Washington Street within the same limits, we have been unable, without much time and expense, to ascertain it exactly. There are at least eighty of these streets within the limits named.

We have, however, taken at random 8 assessors' blocks fronting on Washington Street between Castle Street and Arnold and Thorndike streets (substantially the dividing line between the city proper and Roxbury), to wit: Blocks 473, 476, 538, 543, 581, 586, 594, 610A. We find that the total valuation of these blocks in 1901 was $2,774,400, and in 1913, $2,390,300, or a decrease of about 14 per cent. or $384,100.

We have also taken at random 7 blocks beyond Arnold and Thorndike streets and fronting on Washington or Warren streets, to wit: Blocks 46, 46A, 48, 58, 64, 65B, 68, 106B. We find that the total valuation of these blocks in 1901 was $1,889,000, and in 1913, $2,126,300, thus showing an increase of about 12.5 per cent. or $237,300.

For 1913, the only year in which the assessors have the total for each block, we find that the 58 blocks abutting on Washington Street from Castle to Thorndike and Arnold streets had a total valuation of $15,243,600. Applying to this total the same percentage of decrease shown in the 8 blocks which were compared, we find the total decrease to have been $2,440,390.

The 19 blocks on Washington and Warren streets, from the Roxbury line to Dudley Street, we find have a total assessed valuation in 1913 of $6,026,900. Assuming the same percentage of increase over 1901 as shown by the 7 blocks compared, we estimate the valuation for the 19 blocks to have been increased since 1901, $675,013.

The net result for the entire 77 blocks is an estimated decrease in 1913, compared with 1901, of $1,765,377, or 7½ per cent.

CHARLESTOWN.

We find that the assessed values on Main Street, from the Charles River to the Somerville line, have decreased $310,800 between 1901 and 1912, falling from $4,700,000 in the former year to $4,389,200 in the latter year.

As there was an increase of $190,500 in the Sullivan Square terminal building and the other property of the Elevated Railway at Sullivan Square between 1901 and 1912, we figure the decrease on the rest of the property along Main Street to have been $511,300 or 14 per cent.

We compared 10 blocks abutting on Main Street in 1901 and 1913, finding that in the former year the total was $1,518,400, and in the latter year, $1,274,900, a decrease of 16 per cent. These blocks were in Ward 4, Nos. 153, 156, 176, 204A; in Ward 5, Nos. 13, 26, 30, 35A, 136 and 139.

We found that the 54 blocks abutting on Main Street, beginning at Warren avenue and Front Street and running to Haverhill Street on one side, and beginning at Washington Street north and Chambers Street on the other side, and running to Dorrance Street, had a valuation in 1913 of $9,488,700.

Eliminating block 191, a large part of which is occupied by the Charlestown playground, blocks 199B and 199A, which are Elevated Railway property, we find the remaining 51 blocks had a valuation of $6,335,100. Assuming the same percentage of decrease as in the 10 blocks compared, we have a decrease for the 51 blocks of $1,206,685.

LOSS IN TAXES.

The average tax rate for the last twelve years, that is, 1902 to 1913 inclusive, has been $16 per thousand, which, applied to the loss on the 77 blocks appurtenant to Washington Street, amounts in twelve years to $338,952.38. The same applied to the Charlestown blocks amounts in twelve years to $231,683.52. In other words, the average annual loss in taxes has been $47,553.

REMARKS.

We would call your attention to the following: —

In our opinion the entire decrease shown in the assessed valuations, especially in regard to the Washington Street district, cannot be charged to the existence of the elevated railway in that street, as there has been a greater or less decrease in the years mentioned in other portions of the South End so remote from the elevated structure that it cannot be the cause.

It is also to be remembered that whilst the elevated structure in Washington Street has undoubtedly injured the market value of many estates, its removal at this time would not necessarily restore at once the lost value. The property and neighborhood have adapted themselves to present conditions as well as they could, and it would, in our opinion, take many years to recover under improved conditions.

This applies as well to Charlestown, although the recovery of some of the property there might possibly be more rapid.

It does not seem possible to us for any one to form a reliable estimate of the probable increase in taxes to be paid upon the removal of the elevated structure and the construction of a tunnel between the points under discussion, without a most careful study of the proposed tunnel and its effect, as well as that of the removal of the elevated structure, upon each individual estate on the line, and even then it would be only a guess.

We remain, yours very truly,

MEREDITH & GREW.

APPENDIX E.

BOSTON, Dec. 29, 1913.

Messrs. GEORGE F. SWAIN, *Chairman*, HORACE G. ALLEN, JOSIAH QUINCY, JAMES B. NOYES, DAVID A. ELLIS, *Boston Transit Commission*.

GENTLEMEN: — Referring to your instructions in regard to chapter 84 of the Resolves of the Legislature of 1913, I beg leave to submit an approximate estimate of the cost of substituting a subway for the present elevated structure between the southerly end of the Washington Street tunnel and a point south of Dudley Street, near Dale Street, a total distance of about 2.4 miles, including a connection from the Atlantic Avenue elevated line with the proposed tunnel or subway near Castle Street, also including stations at Dover, Northampton and Dudley streets. The estimate includes an underground loop at Dudley Street to allow some of the southbound trains to return on the northbound tracks. From near the southerly end of this loop trains going to Forest Hills will deflect to the south, pass under streets and private property east of Washington Street, and come to the surface near Circuit Street, then up an incline to the existing elevated structure near Dale Street. An approximate estimate of the cost, including land damages, is $8,920,500.

There are several ways by which an incline might be constructed to connect the Atlantic Avenue elevated line in Harrison Avenue, south of Bennet Street, with the proposed extension of the Washington Street tunnel near Castle Street, or with the tunnel at a point further south, near Dover Street. Any such connection will necessitate either the widening of Harrison Avenue or Washington Street, and the discontinuance of a part of some of the cross streets between Harrison Avenue and Washington Street.

On account of the difference in level between the tracks of the elevated structure and tracks in the proposed extension of the tunnel, the length of an incline, with a maximum grade of 5 per cent., to connect the two will probably be about 900 feet.

The approximate estimate of cost for substituting a subway for the present elevated structure between City Square and Sullivan Square in Charlestown, a distance of about 1.2 miles, is $4,312,000.

This estimate includes an incline from the elevated structure in City Square leading down, mostly through private property, into the proposed subway near Harvard Street, and also includes stations at Thompson Square and at Sullivan Square. It is assumed that the station at Sullivan Square, with a loop for trains to return, will be underground, and that connections for transfer to and from the surface cars will be by stairways.

These estimates do not include any change in construction or location of the repair shops, either at Sullivan Square or at Dudley Street.

Respectfully submitted,

EDMUND S. DAVIS,
Chief Engineer.

APPENDIX H.

REPORT ON CONNECTION BETWEEN DORCHESTER TUNNEL AND SOUTH STATION.

THE COMMONWEALTH OF MASSACHUSETTS.

BOSTON TRANSIT COMMISSION, 15 BEACON STREET,
BOSTON, Jan. 9, 1914.

To the Senate and House of Representatives.

Chapter 93, Resolves of 1913, reads as follows: —

RESOLVE TO DIRECT THE BOSTON TRANSIT COMMISSION TO INVESTIGATE AND REPORT UPON THE ADVISABILITY AND COST OF CONSTRUCTING A SUBWAY TO CONNECT THE DORCHESTER TUNNEL WITH THE SOUTH TERMINAL STATION IN THE CITY OF BOSTON.

Resolved, That the Boston transit commission is hereby directed to investigate the advisability and to estimate the cost of constructing a subway to form a connection between the Dorchester tunnel provided for by chapter seven hundred and forty-one of the acts of the year nineteen hundred and eleven, and the South station, so called, in the city of Boston. The commission shall report to the general court not later than the tenth day of January, nineteen hundred and fourteen, and for the purpose of carrying out the provisions of this resolve may expend a sum not exceeding two hundred and fifty dollars, to be paid out of the treasury of the commonwealth.

The object of this resolve is not clear and it appears to call for no investigation or action by the commission.

As provided in chapter 741 of the Acts of 1911, the commission is now engaged in constructing the so-called Dorchester tunnel. This tunnel will pass under the street on one side or the other of the South Station and, in accordance with the act, a station is to be located "at or near the South Station." The commission considers it advisable to make some connection between this station of the tunnel and the South Station, so called. This view is concurred in by the Boston Elevated Railway Company, and while the plans for the tunnel station have not been completed they will undoubtedly include a physical connection by passageways with some point or points either within, or directly in front of, the said South Station.

Under these circumstances the commission has made no separate estimate of the cost of constructing such connection.

Respectfully submitted,

GEORGE F. SWAIN,
HORACE G. ALLEN,
JOSIAH QUINCY,
JAMES B. NOYES,
DAVID A. ELLIS,
Boston Transit Commission.

APPENDIX I.

REPORT OF JOINT COMMISSION ON INVESTIGATION OF STREET RAILWAY SERVICE.

THE COMMONWEALTH OF MASSACHUSETTS.

REPORT OF THE MEMBERS OF THE PUBLIC SERVICE COMMISSION AND OF THE BOSTON TRANSIT COMMISSION ACTING AS A JOINT COMMISSION ON A RESOLVE OF THE GENERAL COURT PROVIDING FOR AN INVESTIGATION OF THE SERVICE OF STREET RAILWAY COMPANIES.

To the Honorable the Senate and House of Representatives of the Commonwealth of Massachusetts.

Chapter 108 of the Resolves of 1913 reads as follows:

RESOLVE TO PROVIDE FOR AN INVESTIGATION OF THE SERVICE OF STREET RAILWAY COMPANIES.

Resolved, That the members of the board of railroad commissioners and of the Boston transit commission are hereby authorized and directed to act as a joint commission to inquire into and consider the street railway service furnished by the Boston Elevated Railway Company and the Bay State Street Railway Company in the metropolitan district; and to report their conclusions and recommendations, if any, to the general court on or before the tenth day of next January. The joint commission shall give public hearings and shall have authority to administer oaths and to require the attendance of witnesses and the production of books and papers. Members of the commission shall serve without compensation, but the commission may expend for necessary purposes a sum not exceeding five thousand dollars, which amount shall be assessed upon the metropolitan parks district.

In accordance with this Resolve the joint commission met and organized by the election of Frederick J. MacLeod, Chairman of the Public Service Commission, as Chairman, and James B. Noyes, of the Boston Transit Commission, as Secretary.

Nine advertised public hearings were held on the following dates: September 4th, 5th, 17th, November 14th, 21st, 28th, December 11th, 12th, and 15th. In addition the joint commission has held many conferences with the interested parties. For reasons already made clear in communications to the General Court the joint commission was unable to complete its report on or before the 10th day of January, 1914, and was obliged to ask for an extension of time.

After careful consideration of all the matters which have been brought before it and as thorough a study of the situation as time and the other duties of the two commissions would permit, the joint commission now submits its report to the General Court in compliance with the Resolve.

CHARACTER OF THE INQUIRY.

The language of the Resolve is very broad and might be construed to include an investigation of all matters in any way affecting the operation, service, accommodations or facilities of the Boston Elevated Railway Company and the Bay State Street Railway Company in the metropolitan district. The legislative history of the Resolve, however, seemed to indicate that the intent of the Legislature was that only, or at least primarily, matters affecting the dual service of the two companies named should be considered. This view is reinforced by the fact that the Legislature then had under consideration chapter 784 of the Acts of 1913, by which the Public Service Commission was given full authority to deal with all matters affecting the service or operation of a single company. Under that Act the Public Service Commission may investigate any complaints as to rates or service and, without reporting to the General Court, may prescribe such remedies as may in its opinion be just and reasonable. Various parties, however, appeared at the hearings and expressed the desire to be heard upon certain matters affecting the service rendered by the individual companies. The joint commission, therefore, concluded to hear any complaints of this character which might be presented to it.

The subjects considered by the joint commission, therefore, may be divided into two classes:

I. Complaints relating to the service furnished by a single company.

II. Complaints relating to the dual or conjunctive service of the two companies.

As the problems presented by these two lines of inquiry are radically different it seems desirable that they should receive separate treatment.

I. COMPLAINTS RELATING TO SERVICE FURNISHED BY A SINGLE COMPANY.

With reference to those matters which fall within this subdivision of the report, the most general cause of complaint against both companies was the crowded condition of the cars and irregularity of service, especially during the rush hours. That such conditions exist upon certain lines of both companies is a matter of general knowledge. An improvement of the service in this respect is urgently needed, but there are many practical difficulties in bringing about as large a measure of relief as is desirable.

One of the facts most difficult to meet in urban transportation is the great variation in the amount of traffic. The variation of traffic in different months, as indicated by the gross monthly earnings of the companies, is marked. Variations from day to day are proportionately even greater. A pleasant day will bring out crowds of passengers and severely overtax certain lines of travel. The greatest difference, however, occurs in the different hours of the day. The rush hours are, as every one knows, in the early forenoon and in the late afternoon, the greatest traffic occurring during the latter period. These variations are illustrated by the statistical tables which are filed as Appendices 1 to 7, inclusive, with this report.

It is this great variation in the hourly traffic which is the principal cause of overcrowding. The tables given in Appendix 8 of this report, showing the seats furnished by the Boston Elevated Railway Company and the Bay State Street Railway Company compared with the passengers carried for the year ending June 30, 1913, indicate that both of these companies furnish in the aggregate during the entire twenty-four hours as many seats as they carry passengers.

These figures, however, indicate merely that there would be an ample number of seats for all passengers carried upon the lines of both companies if the cars were apportioned with exact accuracy to the needs of each community and if the travel were evenly distributed throughout all hours of the day. That supposition is, however, so much at variance with the facts as to rob these figures of any large significance. The discomfort attendant upon overcrowding during the rush hours is not lessened by the fact that a large number of surplus seats are available when they are not needed.

The problem of handling the enormous volume of traffic which moves during the rush hours in every large city is one of extraordinary difficulty. This difficulty cannot be adequately met by furnishing additional cars, owing to the fact that on many lines existing tracks and facilities are utilized to their full capacity. For instance, it would be practically impossible to add to the number of cars now being operated during the rush hours through the Park street station of the Tremont street subway or through Boylston street, and yet these cars are almost all crowded with people standing. The situation is much the same at other points where overcrowded conditions are most acute.

It is true, however, that on some lines additional cars or additional power supply or additional double-tracking would greatly relieve the congestion during the rush hours. The enlargement of existing terminal facilities and the construction of additional subways would also promote improvements in the existing service. Improvements of this kind, however, involve large expenditures by the companies, and cannot all be made at once. Additional facilities are constantly being supplied by the companies on their own volition or under the direction of the Public Service Commission. The joint commission suggests that these matters may well be left with the Public Service Commission, which has ample authority to deal with them.

In addition to the improvements in service which are possible through increased facilities, a large measure of relief would be furnished by a better distribution of existing traffic. Present conditions are much aggravated by the tendency of passengers to crowd into the first car that comes along, even if it is immediately followed by another car with plenty of available seats. At the suggestion of the Public Service Commission experiments have also been made by the companies in running an express service on certain of the longer routes. This tends to segregate local from long distance passengers and to bring about a better distribution of travel. We believe that this express service might well be extended to other long distance lines where it can be done without impairment of proper local facilities.

Some improvements might also be brought about through traffic regulations covering vehicles in the streets and the enforcement of the same by the police. Some further regulations covering the opening and closing of drawbridges would also prevent obstruction of traffic on certain lines during the rush hours.

It is sometimes urged that a street railway company should provide every passenger with a seat, but however desirable this might be in the public interest, such a requirement, owing to conditions already explained and occasional extraordinary demands upon the service, would be impossible of execution; but if it is impracticable under present conditions to expect that all passengers will be furnished with seats, it is to be expected that if they are asked to stand they will be provided with proper standing room. The fact that it may be impossible to furnish all passengers with seats at all times does not justify excessive or indecent overcrowding.

The suggestion has frequently been made that a limit should be placed upon the number of persons who are permitted to stand on street railway cars. If any regulations of this kind are to be made effective, some legislation seems necessary in order to give the officials of the company authority to exclude from the cars passengers who may persist in their attempt to board a car after it already has its full complement of standing passengers. This remedy has been tried in a few cities, but we are not informed as to the degree with which it is enforced. For instance, in Minneapolis an ordinance commonly known as the straphangers' ordinance limits the number of standing passengers to 50 per cent. of the standing capacity of the car.

It may prove practicable to recommend or require the street railway companies to allow only a certain number of persons standing in each car.

We have not had sufficient opportunity of investigating this matter to be able to make any definite recommendation as to what this number should be. The general principle is all that can now be suggested.

While any such rule might tend to relieve the present congestion of street railway travel, it is also open to serious objection. As we have already indicated, it would probably prove very difficult of enforcement when a multitude of people present themselves for admittance to a car and insist upon getting on. The enforcement of any inflexible rule of this character might also produce considerable hardship. For instance, a night car running once an hour may ordinarily carry but ten or twenty people. Some night an unexpected contingency occurs and a hundred people or more attempt to crowd upon the car. It would be a great injustice to force them to wait an hour for another car, and the company can hardly be expected to be prepared at all times for unforeseen exigencies of this kind. Perhaps the most that can be said is that where cars on a certain line are habitually overcrowded and no other remedy is practicable this remedy should be applied. Some further investigation of this matter by the Public Service Commission might be productive of good results.

So far as present conditions are susceptible of improvement ample authority is vested in the Public Service Commission to deal with them. This joint commission, therefore, makes no recommendation in regard to overcrowding and other operating conditions. The facts which have been brought out in the hearings are, of course, available for the Public Service Commission whenever these matters are brought before it for definite action.

It may be worth while to point out, however, that the work now being undertaken by the Transit Commission will probably remedy a number of the difficulties which have been complained of. There is, undoubtedly, much overcrowding on the Washington street tunnel trains and at Dudley street station. This and the Park street station are probably the most congested points in the transportation district of Boston and the ones most in need of relief. The construction of the Dorchester tunnel to Andrew square will make the latter point a distributing center for the Dorchester district similar to what Dudley street now is, and may reasonably be expected to very largely relieve that crowded terminus.

Chapter 741 of the Acts of 1911 provided that the Boylston street subway should have its terminus at Park street, requiring the substantial enlargement of the present Park street station. Chapter 810, Acts of 1913, however, authorized the Transit Commission to make a temporary connection of the Boylston street subway tracks with those of the present Tremont street subway and to make a further report with reference to the permanent terminal of the Boylston street subway.

In the part of chapter 741, Acts of 1911, relating to the Dorchester tunnel, the Commission is authorized to enlarge Park street station independent of the Boylston street subway. The Transit Commission has, within a short time, received the consent of the Boston Elevated Company to this enlargement, and it is its purpose to proceed immediately to make such enlargement as will be consistent with whatever conclusion may ultimately be reached as to the permanent terminal of the Boylston street subway.

Similarly, the construction of the extension of the East Boston tunnel will very much increase the traffic accommodations afforded the communities which it serves. At the present time, only about 76 cars per hour can be operated at the Scollay square terminal, and at the rush hours these cars are naturally crowded. The extension of the tunnel, by which the present stub terminal will be replaced by a loop, will enable a maximum of not less than 250 cars per hour to be operated, and will, therefore, very much ameliorate the conditions.

II. COMPLAINTS RELATING TO THE DUAL OR CONJUNCTIVE SERVICE OF THE TWO RAILWAY COMPANIES.

As we have already pointed out, it was this phase of the present inquiry which the legislature had chiefly in mind when the resolve creating this

Joint Commission was enacted. It is therefore the most important, as it has proved to be the most difficult problem with which this Commission has had to deal.

Most of the subjects which fall within this subdivision of our report were requests for an increase of accommodations for a single five cent fare,— some contemplating an extension of the Boston Elevated lines through streets where no lines now exist, others asking that the cars of one company should run upon the tracks of the other, carrying passengers a longer distance for one fare. One or two requests were for through cars which would dispense with changing cars but without any reduction in fare.

Before dealing with the specific complaints presented by different communities within the metropolitan district, it seems desirable to consider the present street railway situation in some of its broader aspects.

STATEMENT OF THE PRESENT SITUATION.

There is no question of the fact that there are inequalities in the street railway service in different parts of the metropolitan district. Starting from the center of the city it is possible to ride a much greater distance for a single fare in some directions than in others, and on some lines there is less overcrowding and greater speed than on others.

The following table will illustrate some of these inequalities:

Length of Ride for a Five Cent Fare from the Center of Boston on the Lines of the Boston Elevated Railway Company.

FROM —	TO —	Miles.
Post Office Square,	Marine Park, South Boston,	3.19
Post Office Square,	Neponset,	5.87
Post Office Square,	Milton Lower Mills,	6.08
Milk Street,	Mattapan via Dudley Street,	6.82
Milk Street,	Milton Lower Mills via Forest Hills,	7.76
Milk Street,	Hyde Park line,	6.91
Milk Street,	Dedham line,	8.77
Milk Street,	Charles River (Needham line),	9.18
Park Street,	Newton line (Reservoir) via Beacon Street,	6.04
Park Street,	Newton line (Reservoir) via Brookline Village,	6.44
Park Street,	Watertown via Brighton	7.11
Park Street,	Waverley via Cambridge subway,	7.23
Park Street,	Arlington Heights,	8.66
Summer Street,	Middlesex Fells,	7.89
Summer Street,	Malden (Malden Square),	5.53
Summer Street,	Broadway,	7.88
Scollay Square,	Chelsea (six cents),	3.38
Scollay Square,	Orient Heights (six cents),	4.03

The Bay State Street Railway Company has only one line running to the center of Boston, namely that which passes through Chelsea to Scollay square. On this line a passenger can ride for a five cent fare from Scollay square to Cliftondale, Saugus, a distance of 8.40 miles.

The following table illustrates various long rides which may be taken for a single fare on the Bay State Street Railway Company's lines:

FROM —	TO —	Miles.
Scollay Square,	Sylvan Street, Melrose	7.47
Scollay Square,	Revere Beach via Revere Street,	6.47
Scollay Square,	Revere Beach via Beach Street,	6.53
Scollay Square,	Cliftondale Square, Saugus,	8.40
Scollay Square,	Revere-Saugus line,	6.39
Scollay Square,	Beachmont,	6.48
Dedham Square,	Milton Lower Mills,	8.92
Old Hyde Park line,	Dedham-Westwood line,	6.09
Forest Hills,	Dedham Square via Hyde Park	6.59

An examination of these tables shows that a person may ride from the center of the city to Arlington Heights, Waverley, Middlesex Fells, Charles River or Milton Lower Mills, all distances exceeding seven miles, for a single fare. The longest ride from the center of the city on the elevated lines is to Milton Lower Mills via Forest Hills, a distance of 9.76 miles; while the shortest distances are to those to Marine park in South Boston, a distance of 3.19 miles, and to Chelsea via East Boston, a distance of 3.38 miles — this last trip costing six cents on account of the East Boston tunnel toll.

So far as the Boston Elevated Railway lines are concerned, the inhabitants of Chelsea, Revere and neighboring towns are certainly at a disadvantage compared with some other suburbs of Boston.

The residents of Chelsea and Revere, as well as of other communities as far as eight miles from Boston, may travel to and from Boston over the lines of the Bay State street railway for a single fare. But travel by these lines, therefore, is often slow and subject to vexatious delays, due to the operation of the drawbridges and the congestion of street travel. The Boston Elevated line through the East Boston tunnel avoids most of these obstructions, and is a quicker and more convenient route; but some of the cars reach only the easterly part of Chelsea, and the others run only to Orient Heights, a distance of 4.03 miles from the center of Boston, and a change of cars and an additional fare are required in order to reach Revere Beach reservation or other points beyond Gladstone street.

The charter of the Boston Elevated Railway Company provides that only a single five cent fare shall be charged for a continuous passage in the same general direction between any two points in the territory covered by this system. Thus, a passenger may not only ride from Arlington to the center of Boston, a distance of 8.66 miles, for five cents, but, if he desires he may transfer and continue his ride as far as Mattapan or the Charles river, covering in this way a distance of 18 miles or over for five cents. Even longer rides than this are possible under present transfer arrangements.

In contrast with these long rides for a single fare, there are other instances where two fares must be paid for a very short distance. A five cent fare is charged both by the Boston Elevated Company and the Bay State Company for a single ride, however short. If, therefore, a passenger wishes to ride from a point on one line near any junction to a point on another line beyond it, he must of course change cars and pay two fares. This inequality, however, is inherent in the present situation. If the junction point is changed the inequality will exist in a different location.

There are some other cases where more than a single five cent fare is charged for a comparatively short ride. Such instances are the following:

1. Any passage through the East Boston tunnel, as for instance, from Scollay square to Maverick square in East Boston, costs six cents, on account of the tunnel toll. It should be remembered, however, that the amount of the tunnel toll, one cent, though collected by the Boston Elevated Railway Company, is turned over to the city of Boston after deducting the expense of collection.
2. The fare from any part of East Boston to any point on the line of the Bay State Street Railway Company in Chelsea north of Chelsea square or to any part of Revere is eight cents, four cents to the Bay State and four cents to the Boston Elevated.
3. The fare from any part of East Boston to Mystic Wharf, or Charlestown Navy Yard via Chelsea square, is ten cents,— five cents to the Bay State and five cents to the Boston Elevated. If the trip is made by the East Boston tunnel the fare is six cents, and is all paid to the Boston Elevated.
4. The fare from any part of East Boston via Chelsea square and the Bay State street railway to some points on the lines of the Elevated railway in Everett or Malden is 13 cents, — four cents to the Bay State and nine cents to the Boston Elevated. If the trip is made via the East Boston tunnel and Sullivan square the fare is six cents and is all paid to the Boston Elevated Company.
5. The fare by the most direct route from any part of Malden or Everett on the lines of the Boston Elevated to any point on the lines of the Bay State Co. in the same cities is ten cents, — five cents to the Elevated and five cents to the Bay State.
6. The fare from any point on the lines of the Bay State in Chelsea to some points on the lines of the Elevated in Everett or Malden is ten cents, — five cents to the Bay State and five cents to the Elevated. If the trip, however, is made first to City square, Charlestown, thence to Sullivan square and out again to Everett and Malden, the fare is eight cents, — four cents to the Bay State and four cents to the Elevated.

The inequalities which have been described are undeniable, and at first sight may seem unfair. It might seem, theoretically, that every passenger should have a right to ride an equal distance for the same fare, no matter at what point he might begin to ride. There is no practicable way, however, of bringing about such an ideal arrangement or of collecting fares in such a way that every passenger can ride an equal distance for an equal payment. No system has ever been put in operation which will accomplish this result. Even the zone system entirely fails to accomplish it, as this simply provides that the fare from any point within a given zone to any point in another zone shall be the same. On the Hungarian steam railroads, for instance, the first zone is fifteen miles in width, and the second nine miles, and a passenger pays the same fare for traveling one mile that he does for traveling fifteen, or the same for traveling 15½ miles that he does for traveling twenty-four. On street railways the zones would of course be much narrower, but there would still be inequalities.

There are even greater inequalities in other branches of the public service. Moreover, the inequalities of service and of fare in the Boston metropolitan district, considerable as they are, are not arbitrary inequalities, deliberately imposed by some public or private authority, but are the result of a natural development, in the course of which all communities have benefited, although some have benefited more than others.

Further, some of the existing disparities are the result of physical and topographical conditions which cannot be eliminated. For instance, Chelsea and Revere are separated from the business district of Boston by streams, constituting natural obstructions which there is no way of avoiding except by the construction of bridges and tunnels, which involve enormous expense as compared with the cost of ordinary street railway locations. Natural obstacles, therefore, can only be removed at the expense of creating new financial burdens.

Notwithstanding these considerations, a reasonable approach to equality of facilities is much to be desired, and various inequalities, which have been described above, are real and vexatious.

The fact, however, that these inequalities are not arbitrary, but are the result of development, in the course of which even communities which now seem to be discriminated against have greatly benefited, will be more clearly understood if we outline briefly what the course of this historical development has been.

HISTORICAL OUTLINE OF THE DEVELOPMENT OF THE BOSTON ELEVATED RAILWAY COMPANY AND OF THE BAY STATE STREET RAILWAY COMPANY IN THE METROPOLITAN DISTRICT.

Street cars have been operated in Boston for more than fifty years, but it was not until 1887 that steps were taken to unify the street railway service and adapt it to the needs of the metropolitan district. Before that date the street railway systems consisted of several independent horse car lines radiating from the business center. There were practically no through lines and few free transfers. Chapter 413 of the Acts of 1887 authorized the consolidation of all but one (the Lynn & Boston Railroad Company) of the street railway companies operating in Boston into the West End Street Railway Company.

In accordance with this act the properties of the Cambridge, Metropolitan, South Boston and Boston Consolidated Street Railway Companies were, on November 12, 1887, transferred to the West End Street Railway Company, and all these properties were thereafter operated under one management.

The Lynn & Boston Railroad Company was not included in this consolidation, largely on account of opposition from the representatives of Chelsea and Revere, who thought that the consolidation would result in a monopoly and an increase of fares between these places and Boston. It is largely as the result of this opposition that these communities find themselves to-day in the position of complainants.

This consolidation resulted in a comprehensive and unified car service for Boston and most of its suburbs.. Through lines were established, connecting the suburbs on each side of the city, fares were reduced, the interchange of traffic between various lines was facilitated, and in many other ways the accommodations afforded to the public were improved.

Prior to this time the fare was generally six cents, although five tickets were in many cases sold for twenty-five cents. The fare to Arlington Centre, the terminus in Arlington, was eight cents, and the fare via Everett and Medford to points on the so-called Malden circuit was from eight to ten cents. An eight cent exchange check was provided by chapter 113, section 47 of the public statutes, for passengers transferring from one street railway system to another, and a nine cent exchange check between the Lynn & Boston Horse Railroad and the Boston street railways.

In those days the traffic was very light compared with what it is at present, the cars were small and the speed slow. It was, therefore, practicable for conductors to collect fares for short distances, whereas under the changed conditions now existing this would be impossible. We find, therefore, that on some of the lines the fare for short distances was less than five cents. For instance, on the Cambridge Street Railway about 1880 the fares are said to have been as follows:

Between Bowdoin square and the corner of Charles and Cambridge streets the fare was two and one-half cents if a strip of tickets was bought.

Between Bowdoin square and the following points fares were as follows:

To the railroad crossing on Main street, Cambridge, the fare was three cents cash.

To Dana street the fare was six cents cash or five tickets for twenty-five cents.

To Harvard square the fare was eight cents cash, or four tickets for twenty-five cents.

To Lakeview avenue the fare was ten cents cash or six tickets for fifty cents.

To Mt. Auburn the fare was twelve cents cash or five tickets for fifty cents.

To Watertown or Newton the fare was fifteen cents cash or four tickets for fifty cents.

There was also a local five cent cash fare existing between Watertown and Newton.

In 1871 the fares on the Cambridge street railway varied from three cents to eighteen cents. On the South Boston street railway the fare was six cents or twenty tickets for a dollar. On the Metropolitan street railway cash fares were from five to fifteen cents, and on the Middlesex street railway the fare from Boston to Winter Hill, Medford, Everett and Malden was ten cents cash, and to Union square eight cents.

In 1880 the fare from the center of Boston to Charlestown, Winter Hill and Union square was six cents cash or five tickets for twenty-five cents; to Everett, eight cents cash or four tickets for twenty-five cents; to Malden, ten cents cash or three tickets for twenty-five cents.

Shortly after the consolidation in 1887 the fares on all lines of the West End Street Railway Company were made five cents and the exchange check with the Lynn & Boston was reduced from nine cents to eight cents; eight cent exchange checks were continued between different parts of the system which had formerly been separate street railways. Gradually a good many free transfers were instituted, but the volume of transferring was trivial and the number of transfer points were few in comparison with present conditions.

The above facts show very clearly that the notable development in recent years in respect to fares has consisted in extending long distance rides for five cents, while some of those who ride shorter distances now have to pay slightly more than they did in the days of the horse railway.

Immediately after the consolidation, the West End Company sought some motor power more economical than horses and allowing a greater speed of operation. The installation of a cable system was already begun when recent developments in the use of electricity as a motive power for street cars were brought to the attention of the company, the cable project was abandoned and electrical equipment was substituted. The first electric line was opened January 1, 1889; this was between Brookline and Boston, being equipped in part with an overhead trolley and in part with an underground conduit system. The latter proved unsatisfactory and, after a trial of several months, it was abandoned and the trolley system substituted. On February 16, 1889, the first complete trolley line, that between Cambridge and Boston, was placed in operation; it proved satisfactory from the start. The first equipment, however, was somewhat crude and experiments on a large scale, costing, it is said, more than a million dollars, were required before the development stage was passed and the trolley system became a demonstrated success.

With the installation of electric operation great improvements in the service were made. The lines were extended further into the suburbs, quicker time was made, and much larger cars were put into use; fares were reduced and free transfer privileges largely extended.

In 1897 the entire West End Street Railway Co. was leased to the Boston Elevated Railway Company. During the same year the Tremont street subway was opened for traffic and a new era began, involving the use of subway and elevated lines, constructed at very large expense for the purpose of carrying the bulk of the traffic, at considerable speed, above and below the public streets to points beyond the congested district, there to be distributed by surface cars in the suburbs. The period since 1897 has witnessed the construction of elevated lines between Sullivan square, Dudley street and Forest Hills, of the East Boston tunnel, the Washington street tunnel and the Cambridge subway, and of the East Cambridge elevated, and viaduct line. These lines, providing for rapid transit, have cost, in the aggregate, with the Tremont street subway, about $52,000,000.

Notwithstanding this enormous investment within the last twenty years for the purpose of providing rapid transit facilities, expenditure for this purpose is going on at the present time at a more rapid rate than ever before. The Boylston street subway, the Dorchester tunnel and the extension of the East Boston tunnel are all under construction, involving a total additional cost of approximately $15,000,000.

One result of these improvements has been to make it impossible to collect fares for very short distances on account of the large size of the cars and their comparatively high speed. Long distance riding has very much increased and great developments have taken place in the suburban districts. The average length of a half round trip between the center of the city and suburban points in 1889 was 3.62 miles; in 1913 the average length of a half round trip of surface cars was 4.28 miles. A very large number of the surface lines from the center of the city have been abandoned and replaced by rapid transit lines which carry passengers to distributing points beyond the congested district, as at Sullivan square, Dudley street and Forest Hills.

Some interesting comparative information relative to conditions at the time of consolidation and at the present time is given in the following table:

Sept. 30, 1887.

NAME OF COMPANY.	Total Line of Track measured as Single Track.	Passengers.	Number of Miles run.	Rates of Fare.	Car Miles per Mile of Track operated.
Boston Consolidated, .	48.8	22,834,215	3,352,058	10c-8c-5c	54,523
Cambridge, . . .	56.79	14,918,663	2,663,502	Cash, 5c-10c, Checks 9c-8c	42,534
Metropolitan, . . .	92.81	42,970,289	7,081,634	5c,	77,931
South Boston, . . .	13.22	11,085,052	1,606,057	5c,	81,712
	211.62	91,808,219	14,703,251		

June 30, 1913.

Boston Elevated Railway Co., . . .	510.99	326,352,863	57,504,571	5c,	113,054

Attention is especially called to the enormous increase in the frequency of the service as indicated by the number of car miles run per mile of track operated. In 1887 this was 62,667 miles on the average, while in 1913 it was 113,054, an increase of 82 per cent.

The charter of the Boston Elevated Railway Company provides (section 10, chapter 500 of the Acts of 1897):

> Said corporation may establish and take a toll or fare which shall not exceed the sum of five cents for a single continuous passage in the same general direction upon the roads owned, leased or operated by it; and this sum shall not be reduced by the legislature during the period of twenty-five years from and after the passage of this act.

This provision has made it necessary to greatly enlarge the free transfer system, and has made possible the long rides for a single fare referred to above.

It should also be remarked that in the old days, before consolidation, there was much joint use of tracks by the various companies. Competition between the companies under these conditions resulted in very poor service to the public, owing to the frequent and often deliberate blocking of one car by another. These conditions are still fresh in the memories of some of those who will read this report, and they were undoubtedly one of the main causes for the consolidation in 1887; by it past difficulties and deficiencies have been mainly removed and a service has been developed which, in the opinion of many experts, is not on the whole excelled in any large city in the world.[1]

BAY STATE STREET RAILWAY COMPANY.

Aside from the development of the lines now operated by the Boston Elevated Railway Company, there are other suburban lines in the metropolitan district, such as those of the Newton and Boston Railway, the Boston and Worcester and the Blue Hill street railway. The most important of these companies, however, is the Bay State Street Railway Company, which operates the largest mileage of any street railway in the world, its lines extending from Nashua, N. H., through Massachusetts to Providence and Newport, R. I. This company is a consolidation, made July 1, 1911, of the Boston and Northern and the Old Colony street railway companies, which had previously been formed through the consolidation of a large number of smaller railways. Seventy-two street railway companies have thus come under the control of one coherent organization doing a very large business north and south of Boston and including most of the street railway facilities of eastern Massachusetts. The lines of this system connect at various outlying points with the Boston Elevated Railway system, and one of its lines runs its cars over the Elevated tracks to Scollay square. The effect of this consolidation has been to unify transit facilities between the metropolitan district and more distant communities to a remarkable degree; its development has required the expenditure of large sums of money for reconstruction and for facilities to make economical operation possible.

The number of cities and towns served by this system is 91, with a population, according to the last census, of 2,226,913. The mileage of the entire system is 947.118. For the last fiscal year ending June 30, 1913, this company carried 181,280,062 revenue passengers, operated 30,030,806 car miles and had 6,665 employees.

In 1881 the constituent companies which formed this present system were operated with horses in the cities of Lowell, Lawrence, Haverhill, Salem, Lynn, Brockton, Taunton and Fall River. For the year ending Sept. 30, 1881, the mileage of these companies was 49.5. The first of the original companies organized as a street railway was the Lynn & Boston Railroad Company, incorporated April 6, 1859, its charter calling for a location from the town of North Chelsea (now Revere) through Saugus to Lynn. The development of this great system has exhibited the same phenomena which have been previously described with reference to the Boston Elevated Railway system. Uniform methods of operation have been adopted, lines extended and reconstructed, fares reduced, transfers afforded, and in many other ways increased facilities have been given to the public. The result has been that all communities served by this system have benefited in comparison with past conditions, as in the case of those served by the Boston Elevated railway. In Appendix 9 will be found a statement of the fare reductions, extensions of fare limits and transfer privileges which have been granted on these lines between January 1, 1900, and September 30, 1913. On the other hand, there are a few instances where fares have been increased, and a list of these is given in Appendix 10.

---

[1] A recent paper by George Duncan Snyder, published in the minutes of proceedings of the Institution of Civil Engineers, London, March 11, 1913, on "City Passenger-Transportation in the United States," contains the following statement:—

"Boston's transit system is more diversified than that of any other city in the United States. It has one system of elevated lines for use by multiple-unit trains and another for use by electric tramcars, and it has two systems of underground railways for the use of multiple-unit trains — one for the use of electric tramcars, so as to relieve congestion on the streets, and the other to enable the tramcars to cross the harbour. Its subway was the first to be opened in the United States. Its transit system has been developed steadily, and it has kept pace with the growth of traffic more nearly than any other city."

In discussing the paper Sir Maurice Fitzmaurice said:—

"He thought hardly sufficient justice had been done in the Institution to the great work that had been carried out in Boston. Boston was the first city in the United States to have underground railways. He remembered very well going, in 1897, through the works then in progress in Tremont street, Boston. He had been there several times since, and he had always been struck with the remarkable progress that had been made in the construction of the underground railways. THE STATIST of the previous Saturday (8th March, 1913) contained the following statement about the transport facilities in Boston:—

"The city of Boston is provided with transportation facilities in a manner equalled by few and excelled by none. Not only is the centre of the city covered with means of transportation, but the various lines radiate in all directions out into the suburbs, connecting at the termini with the lines of other companies, so that it is possible to travel many miles on what would be called in England a tramway system."

"He regarded that as a very just description of the transportation position in Boston at present. In that connection he thought it should also be remembered that the type of underground railway now so common in the United States — constructed with roof and sides of steel girders surrounded with concrete — originated with Mr. H. A. Carson, M. Inst. C. E., in Boston. It was some years later that the same type was adopted in New York, as explained by Mr. Parsons in his Paper."

SPECIFIC COMPLAINTS.

Thus far we have been dealing with general transportation conditions in the Metropolitan district. We have attempted to point out the inequalities that now exist and to show that these have arisen as the result of consolidations, which have, on the whole, resulted in greatly improved transportation facilities.

The inequalities to which we have referred have resulted in specific complaints from various communities which have been heard by the Joint Commission. It seems desirable that these specific complaints should now be considered and that a statement should be made of the more important facts and considerations in each case.

East Boston — Revere.

The cars of the Boston Elevated Railway Company run through the East Boston tunnel and over surface tracks in East Boston to the terminus of its own line at Orient Heights and thence to Gladstone street over lines leased from the Bay State Street Railway Company. The Bay State runs from this point to Revere Beach, a distance of 1.8 miles over tracks leased from the Boston and Revere Electric Street Railway Company. This is the shortest and most expeditious route to Revere Beach from the city proper. It is substantially shorter than the only other street car route, which is over the tracks of the Bay State Street Railway Company from Scollay square through Charlestown, Chelsea and Revere to Revere Beach. The route by way of the East Boston tunnel is also free from the vexatious possibilities of delay to which the other route is exposed by having to cross several drawbridges. On the other hand, it requires payment of more than a single fare from Scollay square to Revere Beach.

The petitioners urged that some arrangement should be effected by which the Boston Elevated cars would run directly over this route to Revere Beach. They did not urge any reduction in the fare, but this would follow necessarily if the Elevated undertook to run its cars from Scollay square to Revere Beach, because of the requirements of its charter which forbid its obtaining more than five cents for a single ride in the same general direction. The case of the petitioners appealed strongly to the members of the Joint Commission because Revere Beach is less than six miles from Scollay square and because the creation of a short and expeditious route to that beach from Scollay square for five cents, with all the transfer privileges which that involves, would mean not only decided advantages to the inhabitants of the town of Revere, but also to the numerous people dwelling within the Metropolitan district who are anxious to avail themselves of the advantages of the Metropolitan Park Reservation at Revere Beach, which was created for their benefit and for which they have paid in so large a proportion.

The position of the people of East Boston was particularly emphasized, in that they are unable to go to Revere Beach for one fare, and this fact was impressive as an argument in the same direction. The petitioners also urged, with great force, that this improvement in facilities would, in their opinion, be bound to lead to an ultimate increase in returns arising from the greater use which an appreciative public would make of the improved facilities.

The Boston Elevated Railway Company urged that it was impracticable for it to undertake this task without entering upon extensive and costly improvement of the tracks of the Boston and Revere Electric Street Railway Company leased to the Bay State Street Railway Company, and without incurring a large outlay for equipment and other capital expenses. It also urged that this traffic would be very unremunerative, as it involves not merely a passage for five cents from Scollay square to Revere Beach, but means, in a very large proportion of the cases, a passage for five cents from some one of the residential districts to Scollay square and thence to Revere Beach. It also pointed out that travel of this type was very difficult and expensive to provide for satisfactorily, because it occurs for only a few months of the year and for particularly the pleasant Sundays and holidays during that period. The Boston Elevated Railway Company also argued that the creation of this route through the East Boston tunnel would be very likely to cause such congestion in the tunnel as would lead to the serious detriment of the regular patrons using this line.

The Bay State Street Railway Company urged that the taking over by the Boston Elevated Railway Company of its line from Gladstone street to Revere Beach would not only involve the loss of this line to the Bay State Street Railway Company, but would lead to the diversion of practically all of the Revere Beach business now handled by the Bay State Street Railway Company from Scollay square via Chelsea and Revere, as well as its Beachmont business, and would, therefore, have a far reaching effect upon the earning power of the Bay State Street Railway Company. This, it is claimed, would mean an estimated reduction in the gross revenue of that company of about a million dollars per year.

The acquisition by the Boston Elevated Railway Company of rights in the line from Gladstone street to Revere Beach would be bound, therefore, to involve the expenditure of a substantial sum of money on its part as remuneration to the Bay State Street Railway Company.

The members of the Joint Commission were much impressed by the justice of the case made out by the petitioners and believe that it is a consummation to be desired, but do not see how it can be achieved without

(*a*) The payment of a large sum of money by the Boston Elevated Railway Company to the Bay State Street Railway Company.

(*b*) The expenditure of a substantial sum of money by the Boston Elevated Railway Company in improvement of the track and roadbed of the line from Gladstone street to Revere Beach, for the purchase of equipment and for the incurring of other capital expenses, and

(*c*) The undertaking by the Boston Elevated Railway Company of a large traffic which is bound to be unremunerative, at any rate for the immediate future.

The question of whether the Boston Elevated Railway Company is able to bear this financial burden at this time, in connection with other desirable extensions, is one that will be discussed later in this report.

Pending the consideration and adoption of some practicable means of affording a larger measure of relief, it should at least be made possible for the residents of East Boston to reach Revere Peach for one fare. This could be accomplished if the Bay State Street Railway Company could make some arrangement by which its cars could be run over the tracks of the Boston Elevated Railway Company to Maverick square.

Chelsea.

In order to reach Scollay square for the five-cent fare the residents of Chelsea must use the lines of the Bay State Street Railway Company.

This route passes through narrow streets in Charlestown, and involves the crossing of three drawbridges. The crowding of these streets and the use of the drawbridges are sources of delay and annoyance. When Scollay square is reached an additional fare is required if a passenger desires to go to any destination on the line of the Boston Elevated Railway Company.

The petitioners urged that it is an unjust discrimination against Chelsea that it should be compelled to undergo these delays and pay more than one fare to have access to the various parts of the Boston Elevated system, when many other communities at greater distances from Boston enjoy much greater privileges. They also argued that if the Boston Elevated Railway Company took over the line of the Bay State Street Railway Company from Boston to Chelsea it would get an adequate return upon its investment because even if that part of the travel which is transferred at Scollay square for more distant points upon the Elevated system should be carried at a loss, the greater part of the travel would consist of passengers from Chelsea to Scollay square and from Scollay square to Chelsea, and of local travel between the different parts of Chelsea which would be distinctly profitable. The petitioners urged that a tunnel should be constructed from Chelsea to Boston in order to avoid the delays and annoyances mentioned by them, and that meanwhile arrangements should be made so that certain lines of Bay State cars from Chelsea might run through the East Boston tunnel to Scollay square.

The Boston Elevated Railway Company pointed out that the extension of its lines to Chelsea would involve a certain amount of unremunerative travel caused by transfers, either from Chelsea lines to its other lines, or vice versa, and that it would be compelled to pay the Bay State Street Railway Company a very substantial sum for the lines which it would be compelled to take over if this arrangement were effected. The company also pointed out that the East Boston tunnel as at present constructed could not take on the additional amount of traffic which the petitioners urge without seriously impairing its facilities for serving its present patrons.

The Bay State Street Railway Company introduced evidence tending to show that it would be entitled to a very large sum of money as recompense for any taking by the Boston Elevated Railway Company of the Bay State Street Railway Company's Chelsea system.

The Joint Commission believes that it would be unwise to attempt to impose the burden of the Chelsea traffic upon the East Boston tunnel as at present constructed, but has no doubt that considerable relief may be afforded to Chelsea by the extension of the East Boston tunnel which is now in process and which ought to be completed before the end of next year. The Joint Commission does not deem it proper to pass upon the question of a separate tunnel from Chelsea to Boston, as that matter is now pending before the legislature.

The Commission believes that the dissatisfaction of the people of Chelsea with existing transportation facilities is justified and that under a proper arrangement of transportation facilities within the metropolitan district Chelsea should be placed in a position of equality with other communities similarly situated.

Malden.

At the present time the Boston Elevated Railway Company and the Bay State Street Railway Company both have locations in the city of Malden. In addition to the lines separately owned and operated by the two companies in that city there is a joint operation from Malden square east over Salem street and also southeasterly from Malden square over Ferry street towards the Everett line.

At the present time all the citizens of Malden with the exception of those residing in the northerly part of the city can reach Boston over the lines of the Boston Elevated Railway Company by the payment of a single fare. From Malden square northerly to the Malden-Melrose line the street car service is, however, furnished by the Bay State Street Railway Company. Passengers from that portion of the city desiring to reach other portions of Malden or to ride through to Boston are obliged to pay two fares. The petitioners suggested that owing to this situation the residents of the northerly section of Malden were placed at a disadvantage as compared with other sections of the city, and strongly urged that the Boston Elevated Railway Company, by lease or otherwise, should take over the tracks of the Bay State company from Malden square to the Malden-Melrose line, a distance of about a mile.

It was urged by the Boston Elevated Railway Company that its line to Malden square was already longer than it could profitably operate, and that the extension of this line requested by the petitioners would result in a substantial loss to the company.

It was also pointed out by the Bay State Street Railway Company that if its line terminated at the Malden-Melrose line as suggested by the petitioners instead of at Malden square, it would mean an additional fare for north-bound passengers to Melrose, Wakefield, Reading and intervening points, to Lowell and Lawrence on the line of the Bay State street railway. Such an arrangement would also disrupt the transfer system of the Bay State Street Railway Company relative to Linden passengers who might desire to transfer from the present track of the Bay State street railway to Malden square and the Malden-Melrose line.

It is obvious that the existing transportation arrangements place the residents of the northern section of Malden at a disadvantage as compared with other sections of the city. Residents of this district are obliged to pay double fare not only to reach Boston but also to reach other sections of Malden.

In dealing with questions of street railway transportation, the Public Service Commission and its predecessor, the Board of Railroad Commissioners, have recognized the propriety of providing for a single street railway fare in each city or town wherever this can be done without serious detriment to the street railway company. If the city of Malden were served by the lines of a single street railway company this Joint Commission, in accordance with the principles laid down from time to time by the Board of Railroad Commissioners, would strongly recommend such a rearrangement of existing conditions as would at least permit passengers to ride between any two points in the city of Malden for a single fare. The primary difficulty in this case, as in most other cases considered by the Joint Commission, is owing to the complications incident to the fact that the city is served by two independent street railway companies, each of which is reasonably entitled to a fare upon its own line.

The Commission recognizes that the residents of the northern section of the city of Malden have just cause of complaint, and will indicate in a later part of this report what seems to the Commission to be the most practicable method of dealing with this complaint and others of a similar character.

Medford.

The lines of street railway in the city of Medford are all operated by the Boston Elevated Railway Company with the exception of a piece of track from the Winchester line to Winthrop square, which is operated by the Bay State Street Railway Company. The cars of the latter company come from Woburn and Winchester, passing the Oak Grove Cemetery and down Winthrop street in Medford to Winthrop square, where the cars are taken over by the crew of the Boston Elevated Railway Company and operated through to Sullivan square.

Complaint was made because the existing arrangement makes it necessary for citizens of Medford residing upon the line of the Boston Elevated Railway Company to pay two fares in order to reach the Oak Grove Cemetery or the Winchester line.

It appears that the line of the Bay State Street Railway Company was constructed from Winchester to Winthrop square, Medford, in 1888, and about that time arrangements were made with the West End Street Railway Company to use the tracks of the latter company to Medford square, which was made the terminus of this line. In 1903 a petition was filed with the Board of Railroad Commissioners by the citizens of Winchester, requesting a waiting room at Winthrop square, Medford. Under date of October 21, 1903, the Board of Railroad Commissioners handed down an opinion stating in effect that a waiting room would not solve the difficulties and suggesting that arrangements be made between the two companies whereby through service should be operated from Winchester and Woburn via Winthrop and Medford squares to Sullivan square. This arrangement was later carried out. Soon after this joint operation was put into effect, a protest was made to the Board of Railroad Commissioners by citizens of Winchester, Woburn and Medford, and a hearing was held on February 14, 1905.

A preliminary order was issued on May 31, 1905, and on June 6, 1906, the following memorandum order was adopted by the Board:

> The data furnished by the company in respect to the character and amount of travel between Medford and Winthrop square fails to give the specific information desired. We are satisfied, however, that the benefits received from through service clearly outweigh the inconvenience resulting from the change in relationship between the two street railway companies. It would be out of the question that we should ask the companies to re-establish the old agreement and restore former conditions.

The petitioners admit that the through service to Boston, which was made effective by this arrangement, is a distinct benefit, but urge that it is possible to retain the through service and still give the advantages in respect to fares which prevailed under the former system. They desire that the cars of the Bay State Street Railway Company from the north should run to Medford square or preferably that the Elevated line should be extended northerly to the Medford-Winchester line. A petition to this effect has been filed with the Public Service Commission, but action thereon has been suspended by that Commission pending the filing of this report.

The Bay State Street Railway Company contended that the existing arrangement for through service under which each company assumed control of its own line is the only one that is reasonably practicable from an operating standpoint, and that if the present fare limit at Winthrop square were extended over the line of the Boston Elevated Railway Company to Medford square it would necessitate an accounting with the latter company for local fares to that point in addition to the present obligations of the company in connection with its through service to Boston. On the other hand, if the alternative suggestion of the petitioners were carried out and the cars of the Boston Elevated Railway Company were operated through to the Winchester line, the Boston Elevated Railway Company contended that the length of the ride would exceed the proper limits of a five cent fare and would be an undue burden upon the company.

It seems to the Commission that if any re-arrangement is to be made of the general fare situation growing out of the dual operation of the two street railway companies some method should be found to relieve the conditions of which complaint is made by the petitioners.

Winchester.

The cars of the Bay State Street Railway Company from Winchester run to Arlington Centre, where they connect with the cars of the Boston Elevated Railway Company, to Harvard square. The petitioners from Winchester urge that these cars should be run through to Harvard square without change over the tracks of the Elevated Company.

Prior to the hearing by the Joint Commission, the Public Service Commission had already given a hearing upon this matter. At the conclusion of that hearing the Public Service Commission urged upon the two companies the desirability of reaching an agreement by which this service should be put into effect. Negotiations were accordingly entered into between the two companies, but it has been found impossible thus far for them to reach an agreement. The Boston Elevated Railway Company has claimed that the running of these cars over its lines in conjunction with the operation of the single track location of the Bay State Street Railway between Arlington and Winchester would not be conducive to efficient operation; that the delays on the single track line would render these cars unreliable and of little value as a part of the Boston Elevated service, and that this arrangement would tend to increase the congestion at the Harvard square station of the Cambridge subway. Whatever pertinence there may be in these objections it seems to the Joint Commission that as this case involves no fare readjustments it may well be left with the Public Service Commission for final disposition.

Hyde Park.

At the present time Hyde Park is served by two single track lines of the Bay State Street Railway Company. One of these lines extends from the Boston boundary line at Readville trotting park in a northerly direction by way of Hyde Park avenue, a distance of about 3.17 miles, to the former boundary line between Boston and Hyde Park, where the line connects with the Boston Elevated railway line to Forest Hills. The other line of the Bay State Street Railway Company extends from the Hyde Park-Dedham boundary line by way of River street in a northeasterly direction, a distance of about 3.31 miles, to the former boundary line between Hyde Park and the Mattapan district of Boston, where it connects with the Boston Elevated railway line by way of Blue Hill avenue. These two lines of the Bay State Street Railway Company intersect at Cleary square, in the center of Hyde Park.

The cars of the Bay State Street Railway Company are operated by that company to the former Hyde Park-Boston line, and from that point are carried through to Boston by the crew of the Boston Elevated Railway Company. A traffic arrangement exists between the two companies under which passengers on the Hyde Park avenue line are carried to Forest Hills without payment of an additional fare. Outbound, a single fare carries a passenger to the former Boston-Hyde Park line, beyond which point an additional fare is collected by the Bay State Street Railway Company. Passengers, however, who board the Hyde Park cars at Forest Hills or points south of it are carried for one fare to any part of Hyde Park. At the present time residents of Hyde Park can travel from any part of Hyde Park to any other part of Hyde Park on the lines of the Bay State Street Railway Company for a single fare, and from any part of Hyde Park to Dedham, to Mattapan and to Forest Hills for the same fare; but to reach the center of Boston or other points on the Boston Elevated railway system beyond Forest Hills they are obliged to pay two five-cent fares.

The citizens of Hyde Park protest against the continuance of this condition and request some rearrangement of existing conditions which will enable passengers from any part of Hyde Park to reach Boston and all other points served by the Boston Elevated Railway Company for the payment of a single five-cent fare. For many years this matter has been a subject of agitation by the citizens of Hyde Park, their chief contention now being that Hyde Park comes within the precedent established in the case of West Roxbury and Roslindale by the Board of Railroad Commissioners.

In 1901 a petition was filed with the Board of Railroad Commissioners by residents of Roslindale asking for a reduction of fare on the New York, New Haven and Hartford railroad. In the order issued in this matter on December 17, 1901, the Board of Railroad Commissioners, after declining to recommend a reduction of fares on the steam railroad, made the following suggestion:

> We think we ought to add, that in our opinion the real disadvantage under which the people of Roslindale suffer is the lack of street railway accommodation usually enjoyed by those similarly situated. While with one exception all other parts of Boston are connected with a five-cent fare, the people of Roslindale have to pay two such fares in travelling to

and from the other parts of the city, — one to the West Roxbury & Roslindale Company and one to the Boston Elevated Company.

Through consolidation and voluntary agreement between companies, it has come to be the general rule throughout the State that within city or town limits there should be a five-cent fare. There would seem to be no good reason why some equitable arrangement could not be brought about between the companies interested, which would give to this community the street railway facilities of which it stands in need.

To accomplish this it was necessary that there should be legislative action authorizing a long term lease. Chapter 388 of the Acts of 1902 followed. The settlement of the details of the agreement between the companies, rendered difficult by the number of conflicting interests to be adjusted, was finally concluded, and on February 16, 1903, a form of lease was agreed upon between the boards of directors of the two companies, which was approved with slight modifications by the Board of Railroad Commissioners on April 9, 1903. As a result of this arrangement, citizens of West Roxbury and Roslindale secured transportation to all points of the metropolitan district served by the Boston Elevated Railway Company for the payment of a single five-cent fare.

For several years thereafter bills were presented to the legislature by citizens of Hyde Park to secure the necessary authority for the execution of a lease between the two companies which would make effective a five-cent fare between Hyde Park and Boston. The authority to execute such lease was for several years refused by the legislature. One argument used by the Boston Elevated Railway Company was that Hyde Park's case was different from that of West Roxbury, as the latter community was a part of Boston, and therefore came within the principle of one fare in one municipality, whereas if Hyde Park received a five-cent fare a similar reduction of fare could not be denied to other outside communities.

On January 1, 1912, Hyde Park was annexed to the city of Boston. Throughout the whole course of the annexation movement the desirability of a five-cent fare was a leading argument in Hyde Park in favor of annexation to Boston. Having become a part of Boston, Hyde Park procured from the legislature of 1912 the passage of the enabling legislation required for the five-cent fare. (Chapter 644, Acts of 1912.) This act provided that any part of the railway and property of the Bay State Street Railway Company in Hyde Park might be leased to the Boston Elevated Railway Company by agreement of the stockholders of both companies, provided that the terms of the lease should be approved by the Board of Railroad Commissioners. It was also provided that nothing in the act should be "construed as a legislative determination that there should be a readjustment of fares or of distances covered by fares, but that the Board of Railroad Commissioners should be free to consider any reason for or against any such readjustment of fares and distances covered by fares." After the passage of this act the matter was brought before the Board of Railroad Commissioners by petitions, and a hearing was held, which was attended by a large number of citizens of Hyde Park. While the matter was pending for decision before the Board of Railroad Commissioners, the resolve creating this Joint Commission was enacted, and the case of Hyde Park was again presented before this Commission.

The petitioners contended that the case of Hyde Park came within the precedent established in the case of West Roxbury because both communities are now a part of Boston, and are equally entitled to the application of the principle of one fare in one municipality, because the same companies are involved and because the length of haul in each case is substantially the same. The petitioners also contended that the establishment of a five-cent fare would not impose any substantial burden upon the companies. They also contended that the position of Hyde Park is unique by reason of the fact that Hyde Park is the only part of Boston without the five-cent fare and is, therefore, entitled to immediate and favorable consideration without reference to any action which may be taken, or recommendation which may be made in regard to other communities.

It was contended by the Boston Elevated Railway Company that if it leased the lines of the Bay State street railway in Hyde Park, the cost of operation and fixed charges on these Hyde Park lines, based upon the cost of similar tracks in West Roxbury and upon the same basis of rental as that included in the lease of the West Roxbury lines, would involve an estimated additional expense to the Boston Elevated Railway Company of something over $96,000 per year if the five-cent fare should be extended to these lines. This amount, however, would be diminished by the revenue arising from local travel within the district itself. For the purpose of determining the volume of local traffic in Hyde Park, and the revenue which would come from this source to the Boston Elevated Railway Company, a count was taken by representatives of each of the two companies, under the supervision of inspectors of the Public Service Commission. The results were tabulated and calculations made which indicated that the annual local revenue would amount to something over $56,000. If this amount should be deducted from the estimated additional expense for the through service, it would indicate that the operation of these lines would involve an additional expense to the Boston Elevated Railway Company of about $40,000 a year.

The Bay State Street Railway Company claimed that if the Boston Elevated Railway Company took over its tracks in Hyde Park it should also take over the power house and a car house which are operated in connection with that service, and that the total cost of the property to be taken in Hyde Park alone would be $500,000, instead of $150,000, as estimated by the Boston Elevated Railway Company. The Bay State Street Railway Company also contended that if its lines in Hyde Park were to be taken over by the Boston Elevated Railway Company, the compensation should represent not merely the replacement value of the lines, but also the damage to the remainder of the Bay State street railway. In the language of counsel for the Bay State Street Railway Company,— "The loss of each piece of railway that it is proposed to take means more than the loss of physical property. It is an attack upon the vital strength and earning power. Fair prices may be paid or fair rentals established, but invasions of traffic are involved that would cripple this railway in its ability to maintain its service in the cities and towns which it must continue to serve."

In the present case it was contended that if the Elevated Company should take over the Hyde Park lines, the entire Dedham, Walpole and Westwood business of the Bay State would be so isolated that, in justice, the Boston Elevated Railway Company should take over this portion of their line also, or make proper compensation to the Bay State Street Railway Company for loss of revenue upon these lines. It was also pointed out that if the proposed transfer of lines were made for the benefit of Hyde Park, there would immediately follow loss of accommodation and increase of fares between Dedham, the shire town, and six or seven of the towns with which it has immediate interest in the transaction of private and public business. It was also claimed that neither company was in a financial position to take on additional burdens for further unprofitable long distance riding.

The companies also contended that the precedent of the West Roxbury case was not applicable to Hyde Park, because West Roxbury was a part of Boston at the time when the company received its charter, having been annexed in 1874, while Hyde Park became annexed in 1912, fifteen years after the charter was granted and largely for the purpose of attempting to secure the five-cent fare. It was urged that if Hyde Park secured the five-cent fare by reason of annexation to Boston, then no matter what attempt might be made to guard against the creation of a precedent, the citizens in many other communities, at no greater distance from City Hall, could follow the same course as the citizens of Hyde Park and by becoming annexed to Boston could with equal logic demand the establishment of a five-cent street railway fare.

The claims of Hyde Park for a five-cent fare were pressed before the Joint Commission with great vigor, determination and ability. Whatever distinction may be drawn between the cases of West Roxbury and Hyde Park — and it is probable that the Board of Railroad Commissioners had no thought of making a precedent by its recommendation in the West Roxbury case, as all other portions of Boston then enjoyed the five-cent fare — the citizens of Hyde Park feel very strongly that the two cases are analogous and that the existing situation constitutes an improper discrimination against Hyde Park. If the five-cent fare were granted to all parts of Hyde Park, the maximum ride to the center of Boston would be slightly over ten miles. This distance is about one mile greater than the distance from the Summer street station to Charles river, West Roxbury, and is longer than any haul now given from the center of the city on the lines of the Boston Elevated railway.

The length of the ride desired by Hyde Park for a five-cent fare is greater than that asked for by any of the other communities which were heard by the Joint Commission. In so far as Hyde Park can have any special claims for consideration as against these other communities, it must rest upon the theory invoked in the West Roxbury case, that there should be a single fare within city or town limits. While this principle has been recognized by the Board of Railroad Commissioners in many decisions it has never been regarded as an inflexible rule. The Board has on numerous occasions refused to apply that principle where the length of ride involved or the financial condition of the operating company would make such a requirement unreasonable. Moreover, where this principle has been applied, it has been confined, except in the West Roxbury case, to the fare exacted by a single street railway company.

With reference to the claim of Hyde Park for special consideration because it comes within the principle of one fare for one municipality, it should be pointed out that its position in this respect is not unique. In Arlington, Medford, Malden, Everett and Chelsea, as a result of the dual street railway service, it is necessary to pay two fares for a ride between certain portions of the same city or town.

If the case of Hyde Park were the only one with which this Commission had to deal, it might be urged that the estimated additional expense to the Boston Elevated Railway Company for taking over this service is not serious enough to stand in the way of an improvement of such far-reaching benefit to the people of Hyde Park. But if relief is granted to Hyde Park no sound reason can be urged for withholding it from the other communities that have appeared before this Commission. Not only that, but if a five-cent fare were established for Hyde Park, there would seem to be little justice in denying similar privileges to other communities within a ten mile radius of the center of Boston. This area would include all or parts of Milton, Newton, Waltham, Winchester, Woburn, Stoneham, Melrose, Saugus, Chelsea, Revere and Lynn. To extend the limits of the five-cent fare over this entire area would probably result in financial disaster to the Boston Elevated Railway Company and would arrest street railway development in the metropolitan district.

The Commission is fully aware of the serious importance of this matter to Hyde Park, as the existing situation tends to check the development of that section of Boston as compared with adjacent districts now having the privileges of a five-cent fare. The present situation is unjust and cannot be expected to endure. The inequalities of the existing system are, however, not confined to Hyde Park but extend to every part of the metropolitan district where a dual street railway service now exists. On no theory of justice or equity can the Commission single out one community for especially favored treatment. As the complaint is general, the remedy must also be general and one that will be just and equitable in its applications to all parts of the metropolitan district.

STATISTICAL AND FINANCIAL.

It is essential for the formation of a fair judgment on the important questions relating to the dual service of these two companies to consider their growth during recent years and their present financial condition. The essential facts regarding this matter will here be summarized.

Reference is made to the statistical tables contained in Appendices 11, 12 and 13, which give much interesting data regarding the West End

Street Railway Company and the Boston Elevated Railway Company at five-year periods since 1888. Particular attention should be directed to several of the more important facts disclosed by these tables. It appears that the capital invested per one dollar of gross earnings was $2.3875 in 1888, and that this has steadily increased until it reached $6.22 in 1913. In other words, the capital has grown very much faster than the gross earnings.

It also appears that the number of revenue passengers carried annually for each one dollar of investment has shown a great reduction. In 1888 for each one dollar of investment 8.37 revenue passengers were carried, so that the gross revenue earned on the basis of a five cent fare was $0.4155 for each one dollar of capital invested; whereas, in 1913 only 3.09 revenue passengers were carried for each one dollar of investment and the revenue therefrom, at a five cent fare, was only $0.154 for each one dollar invested.

These tables also show that while taxes in 1888 were 3.11 per cent. of the gross earnings, this percentage in 1913 was 6.64 per cent., or more than double; and, at the same time, the percentage of dividends to gross earnings has declined from 9.68 in 1888 to 7.05 in 1913.

The immense growth in the volume of free transfers is clearly indicated. The number of free transfer passengers has increased from about 11,000,000 in 1893 to upwards of 218,000,000 in 1913. Of course, many of these transfers are occasioned by the necessity of changing from the Elevated to the surface lines at Sullivan square, Dudley street and Forest Hills.

It should be stated that the deficits of the Boston Elevated Street Railway Company which are shown for the years 1912 and 1913 were largely, if not entirely, due to the losses from the strike which occurred in June and July, 1912, thus affecting both of these fiscal years.

Similar tables of statistics with reference to the Bay State Street Railway Company are given in Appendices 14 and 15. These tables show that essentially the same tendencies appear in these two street railway systems.

It is apparent from the figures which have been given that the investment obligations of the Boston Elevated Railway Company have been increasing much faster than the earnings and that its surplus over dividends is exceedingly small. The gross investment has, of course, been greatly expanded by the many costly additions which have been made to the transportation system. The table in Appendix 11 shows that the deficit at the close of the last fiscal year was $496,377. If the company is to earn its interest and fixed charges and a dividend of 6 per cent. for the year ending June 30, 1914, it must not only cover this deficit but earn the further sum of $315,764 in order to pay additional fixed charges and dividends on additional capital stock, thus requiring $812,141 more than was earned for the last fiscal year. Moreover, within the next two or three years the company will have to operate three additional subways, which it has already leased and the rental upon which will amount to $675,000 per annum. It will also have to provide large sums for equipping these subways and for additional power and cars. Thus, looking ahead but a few years, it is evident that the company will have to earn nearly $2,000,000 a year, net, above what it earned last year, without regard to increases in wages or other operating expenses, if it is to maintain its 6 per cent. dividend. Added to this, the arbitration board, which has recently rendered its report, has awarded increases in wages to the employees of the company which will amount to a very large sum annually. If we add this sum to the amounts above mentioned, it is evident that the company must be in a position to meet an enormous increase in the demands upon its financial resources. These figures emphasize the necessity of rigid economy and a proper conservation of the revenues of the company.

In this connection the Joint Commission deems it proper to quote the following extracts from the report of the arbitration board:

CONCLUSION OF BOARD ON FINANCIAL CONDITION OF COMPANY.

The evidence before the board would seem to indicate that burdens have been thrown upon this company faster than the increase in traffic justifies. Besides the rapidly growing item for rental of subways now built and building, it should not be forgotten that the public begins by exacting as a charge upon its earnings, ahead of dividends, interest, wages, and everything else, an annual sum in taxes which in 1913 amounted to $1,128,021. This sum is substantially equal to the amount the company paid on dividends, which for that fiscal year amounted to $1,197,000.

A glance at the rapidly increasing capitalization of the company, which has gone on at a rate out of all proportion to the increase in gross earnings, indicates plainly enough that this company is being rapidly overloaded by excessive capital expenses and rentals for capital expenses incurred by the city in the construction of tunnels and subways. If we include, as we should, the capital expenses by the city in subways, because the burden of paying interest and sinking fund falls upon the company, we find that in 1897, with gross earnings of $8,712,032, the company was obliged to earn a return upon $25,291,913 of capital. In 1913 with gross earnings of $16,968,328, the company was obliged to earn a return upon $105,684,146 of invested capital. During this period, therefore, the gross earnings increased 94.6 per cent. and the capital investment increased 317.86 per cent.

This policy, if continued, is going to send the company to the poorhouse, and it is also going to render it impossible for the company to obtain each year the additional capital which it must have in order to supply the transportation service needed by the people of this community. Today the stock of the company is selling below par, and, under the provisions of law that the capital stock must always equal the amount of bonded indebtedness, the company has the right to sell only $4,236,800 more bonds, and then, unless the stock rises again to par or above, it will begin to lack funds. It will be unutterably foolish and not tend to better traffic conditions, but lead to almost irretrievable injury, if this process of overloading the company is not stopped, so as to give the gross earnings of the company a chance to catch up with its capitalization. Thereafter the additional yearly burden placed upon the company should proceed at a rate measured in proportion to the possibilities of the situation.

POSITION OF STOCKHOLDERS.

If it be true that the metropolitan community is loading upon this company burdens which it cannot bear, the community is not only unwise in its own interest, but it is committing an act of rank injustice towards the 6,000 shareholders who have come forward to supply capital amounting to $25,586,828.13, including premiums.

Fifteen hundred of the Elevated stockholders own less than five shares, 3,000 less than 10.

In connection with this discussion of the finances of the Boston Elevated Railway Company, it becomes pertinent, in view of the various requests made for extensions of the company's lines, to inquire how far the company can profitably carry passengers for a five-cent fare. A discussion of this matter will be found in Appendix 16. It is there pointed out that while no data are available for exact determination of this matter, an analysis of certain statistics of the company seems to warrant the inference that the limit of a profitable ride is about four and a quarter miles. This, of course, is not to be taken to mean that the operation of a line in excess of four and a quarter miles is necessarily unprofitable. A considerably longer line may be operated with profit to the company if the maximum distance riding is offset by sufficient amount of local and short distance riding. Moreover, if the system is considered as a whole, certain longer lines which are in themselves unprofitable may be offset by shorter lines in other directions where the average ride is less than four and a quarter miles. Care must, therefore, be taken not to press too far any conclusions which may be reached from this line of inquiry.

In Appendix 17 a table is given showing the average number of revenue passengers per half round trip and the miles of single track operated by the West End Street Railway Company and the Boston Elevated Railway Company during each year since 1888. In this connection the following facts are of interest: The total operating expense of the Boston Elevated Railway during the year 1912-13 was $15,196,090. The total number of half round trips was 13,443,554. The average cost per half round trip was, therefore, $1.13.

In order to cover this cost on the basis of a five cent fare an average of 23.6 passengers must be carried on each half round trip. The following table gives the average number of revenue passengers on several routes. Many of these routes show an insufficient number of passengers to meet the average operating cost, without allowing any return to capital.

BOSTON ELEVATED RAILWAY — REVENUE PASSENGERS ON CERTAIN ROUTES FOR THE YEAR ENDING JUNE 30, 1913.

Orient Heights to Scollay Square.

	Trips run.	Revenue Passengers (collected on Cars).	Average per Trip.	Average per One-half Trip.
Route 419, ...	66,004	3,964,180	60.06	30.03

Sullivan Square through Malden Square.— Sullivan Square to —

	Trips run.	Revenue Passengers (collected on Cars).	Average per Trip.	Average per One-half Trip.
Route 603, Malden Square, ...	24,232	934,076	38.55	19.28
Route 624, Salem Street station via Main Street, ...	12,680	385,860	30.43	15.22
Route 632, Salem Street station via Ferry Street, ...	39,810	1,919,416	48.21	24.11
Route 662, Edgeworth, ...	36,730	1,368,092	37.25	18.63
Route 688, Broadway, Malden, . . .	21,430	955,718	44.59	22.29
Route 689, Melrose line	28,611	1,500,280	52.44	26.22

Winthrop Square to Sullivan Square.

	Trips run.	Revenue Passengers (collected on Cars).	Average per Trip.	Average per One-half Trip.
Route 602, ...	24,618	1,037,777	42.15	21.08

Forest Hills and Hyde Park Line.

	Trips run.	Revenue Passengers (collected on Cars).	Average per Trip.	Average per One-half Trip.
Route 112, ...	58,289	1,008,436	17.30	8.65

NOTE: — All of these lines connect with the rapid transit terminal to which they deliver passengers, which are credited on this statement as revenue passengers, and from which they receive many passengers not here shown, whose fares are paid on rapid transit lines on their stations, or on other surface cars.

REMEDIES FOR THE PRESENT SITUATION.

While the inequalities and injustices which exist in the present situation are the result of past developments and not of deliberate action, they are none the less burdensome and unjust.

The fundamental difficulty in attempting to deal with them in any flexible manner is the rigid provision in the charter of the Boston Elevated Railway Company which guarantees to the company the right to charge a fare of five cents for any passage upon its lines, and also imposes upon the company the obligation of carrying passengers in the same general direction over its entire system for a fare of not more than five cents.

In dealing with the situation as it now exists the only question that can be considered is whether the Boston Elevated Railway Company ought to be asked to extend its transportation facilities to the various communities whose cases have been heard and to other communities whose claims have been brought to the notice of the members of the Commission without receiving any additional compensation for the additional facilities furnished.

This question is complicated also by the fact that the lines which the various complainants desire the Boston Elevated to assume belong to another and separate corporation,— the Bay State Street Railway Company. It is true that under section 25 of the Public Service Commission act (chapter 784, Acts 1913) the Commission is granted the power to require companies whose lines form a continuous or connecting line of transportation to establish through routes and joint rates, fares and charges for the transportation of passengers and for the operation of cars for such transportation, the Commission having authority to determine the amount of any through rate payable to each company. It is, however, expressly provided that each company shall have full control of the cars of the other company while they are operated over its tracks. Moreover, if the through rate is only five cents the Boston Elevated Railway Company is entitled, under its charter, to receive the entire fare, and the other company can hardly be expected to operate its portion of the through route without compensation.

If the object sought by the petitioners is to be accomplished by a slightly different method, and if the Boston Elevated Railway Company is to be asked to take over, by lease, purchase or otherwise, certain lines of the Bay State Street Railway Company, it is to be remembered that the latter company not only owns these lines, but also owns power houses, plants, machinery and apparatus connected with and contributory to that service. The Bay State Street Railway Company cannot be deprived of these without just compensation, and this must be paid to it by the Boston Elevated Railway Company in order to accomplish the ends sought by the complainants, either as the result of an amicable adjustment or as the result of direct or indirect action of public authorities. Such compensation would in either event include, not only the value of the property actually taken over by the Boston Elevated Railway Company, but also the injury caused thereby to the remainder of the Bay State system.

It is obvious from the analysis which has already been made of the financial condition of the two companies that the Boston Elevated Railway Company cannot assume the large burden of taking over all these lines in addition to its present obligations without financial injury of such a nature and to such an extent as to make it entirely unjust to ask that company to assume such burdens at the present moment.

The provisions of the charter of the Boston Elevated Railway Company, the complications growing out of the dual ownership of lines which it is desired to operate for a single five cent fare, and the present financial condition of the Boston Elevated Railway Company, constitute the main obstacles to the relief sought by the various complainants. But there are other obstacles which exist in the way of a complete solution of the problem.

The Resolve in terms was limited to two companies, the Boston Elevated Railway Company and the Bay State Street Railway Company; but there are three other street railway companies which have lines within the metropolitan district,— the Blue Hill, the Boston and Worcester and the Middlesex and Boston, and it is impracticable to deal with the situation in any complete manner without considering these lines as well as the two which form the subject of the Resolve.

Moreover, a comprehensive study of transportation conditions in the metropolitan district should not be limited to the street railway companies, but should include all the transportation facilities in the district by steam railroads as well as by street railways. It is not impossible that certain lines within the district now operated by steam could be utilized to better advantage to the owners and with benefit to the public if they were made a part of the street railway system, or at any rate more closely co-ordinated with existing street railway facilities.

Such lines, for instance, as the Shawmut branch of the New Haven, and possibly such as the Medford branch of the Boston and Maine and the Watertown branch of the Fitchburg might be disconnected from the steam railroad systems and made a part of the street railway systems. The Joint Commission considers that there is a strong probability that some such rearrangement of certain branches of steam railroads might be worked out with much benefit to all concerned, and in such a manner as to provide for future needs, and perhaps obviate the construction of expensive subways or elevated lines. On the northerly side of the city the conditions in East Boston and Revere would be much improved if the Boston, Revere Beach and Lynn railroad could be electrified and carried under the harbor to a terminus in the city.

This problem of correlating the railroad lines with the street railway lines has never been reported on by any public authority. It is worthy of investigation; and the present financial condition of the steam railroads renders this a favorable time for suggesting such an inquiry.

As has already been pointed out, the order under which the Joint Commission is acting deals only with two of the street railway companies furnishing part of the transportation facilities for the metropolitan district, and these two street railway companies exist and operate under different laws,— the Bay State under the general law, and the Elevated under a special charter. The difficulties of creating a proper transportation system for the metropolitan district, growing out of the Elevated's special charter, have, in the opinion of the commission, often been exaggerated, but real difficulties exist. It should not, however, be overlooked that no one seriously contemplates cutting the five-cent fare, the right to charge which is undoubtedly protected by the Elevated's charter. The corresponding obligation of the Elevated to carry passengers over the whole line in the same general direction for five cents may be waived in whole or part by the Commonwealth.

Without elaborating the argument, it is very clear that quite different relations between these two companies and other companies furnishing part of the transportation facilities of the metropolitan district must be created before fair, undiscriminating and adequate facilities can be furnished to the entire district. It is not for the Joint Commission now to forecast just what those relations may most advantageously be.

The Joint Commission believes that no large measure of relief can be afforded to the various communities at the present time by a piece-meal dealing with the situation, and that the only hope of any substantial and effective immediate relief for those communities which suffer injustice or discrimination under the present system is by a thorough and fundamental consideration of the whole metropolitan transportation problem, involving the five street car systems which serve the district, and such railroad systems or such parts thereof as may be properly included within the same investigation; and involving not only the consideration of questions of fares and service, but also the question of the charter rights and property rights of the parties and possible changes which might result from a consolidation or combination of all or a part of the companies concerned.

If it is desirable that the service of the Boston Elevated Railway Company be extended beyond the present limits of its lines, it may be found, upon a more exhaustive study of the whole situation, that the only practicable method of providing these additional facilities is through an amendment of the company's charter which will relieve it from some of its present obligations.

It is, of course, not to be expected that the traffic in each particular district served should be remunerative. The larger, social point of view must also be considered. It is undoubtedly true that an urban population should, if practicable, be distributed into the suburbs and not crowded together in the heart of the city. If, therefore, a long distance line has sufficient short distance riding to make it remunerative as a whole, it may well be that the community will be benefited if the short distance riders help to pay for carrying the long distance riders further than would in itself be remunerative. Every line must be considered with reference to its own peculiar conditions.

These considerations, however, do not apply to transit from a suburb, through the center to another suburb on the other side of the city, or even to unlimited free transfers which allow a person to go from one point to another point for one fare if the general direction is not changed. If unreasonably long through rides and unreasonably free transfers could be eliminated it might be possible for the companies to increase in other directions the accommodations which they now furnish.

The question of amending the present charter of the Boston Elevated Railway Company, however, not only affects the communities which were heard by the Joint Commission, but also the interests of all parts of the metropolitan district. That inquiry would involve a more elaborate investigation than this Joint Commission has been able to make or could possibly make in response to the resolve now under discussion.

The Joint Commission, therefore, does not feel that it should, in justice to all concerned, attempt at this time any partial solution or recommend any definite action with regard to the various individual complaints affecting dual service which have been heard by the Joint Commission. The intricacy of the question involved has been pointed out in previous pages, and the various ramifications of this complicated subject explained.

The Joint Commission appreciates that the working out of a plan practicable in its detail and feasible of operation on the one hand, and just to the communities and to the various companies and their security holders on the other hand, is something which would require a very thorough investigation and most careful consideration; but it believes, none the less, that some such plan can be worked out and made effective.

The Joint Commission does not wish to be understood as intimating that the only possibility of relief for the various communities lies in this direction. It hopes that after a period of recuperation the Boston Elevated Railway Company may be in a position to assume a still larger measure of public service; but it feels that that company is in no position at the present moment to assume any large additional burdens and that the only just and practicable plan for immediate relief is the one which it has suggested.

The Joint Commission, therefore, respectfully recommends that to some public authority be committed a thorough and fundamental consideration of the whole metropolitan transportation problem, involving all street car systems which serve the district and such railroad systems, or such parts thereof, as may be properly included within the same investigation; and involving not only a consideration of questions of fares and service, but also questions of the charter rights and property rights of the parties and the relations between the various companies concerned as well as the relations of the transportation system as a whole to the municipalities constituting the metropolitan district.

Respectfully submitted,

FREDERICK J. MACLEOD, *Chairman*,
GEORGE W. ANDERSON,
EVERETT E. STONE,
CLINTON WHITE,
GEORGE W. BISHOP,
Public Service Commission.

GEORGE F. SWAIN,
HORACE G. ALLEN,
JOSIAH QUINCY,
JAMES B. NOYES, *Secretary*,
DAVID A. ELLIS,
Boston Transit Commission.

MARCH 18, 1914.

THE COMMONWEALTH OF MASSACHUSETTS.

APPENDICES TO THE REPORT OF THE PUBLIC SERVICE COMMISSION AND THE BOSTON TRANSIT COMMISSION, ACTING AS A JOINT COMMISSION, RELATIVE TO THE SERVICE OF STREET RAILWAY COMPANIES (SENATE NO. 448).

APPENDIX 1.

NUMBER OF CARS IN SERVICE EACH HOUR, FRIDAY, FEBRUARY 20, 1914, — A TYPICAL WEEK DAY.

HOUR ENDING —	Elevated Lines.	Cambridge Subway.	HOUR ENDING —	Elevated Lines.	Cambridge Subway.
6 A.M.,	86	12	4 P.M.,	98	18
7 A.M.,	122	18	5 P.M.,	154	24
8 A.M.,	149	33	6 P.M.,	183	33
9 A.M.,	165	24	7 P.M.,	117	12
10 A.M.,	124	12	8 P.M.,	74	16
11 A.M.,	84	12	9 P.M.,	74	12
12 M.,	82	12	10 P.M.,	74	12
1 P.M.,	82	12	11 P.M.,	82	16
2 P.M.,	82	12	12 P.M.,	66	10
3 P.M.,	82	12	1 A.M.,	66	10

APPENDIX 2.

PASSENGERS CARRIED TO AND FROM THE TERMINAL STATION OF THE BOSTON ELEVATED RAILWAY DURING CERTAIN HOURS.

Passengers on trains arriving at Sullivan Square:—	
In the hour ending 6 A.M.,	330
In the hour ending 6 P.M.,	12,258
Passengers on trains leaving Sullivan Square:—	
In the hour ending 8 A.M.,	10,626
In the hour ending 9 A.M.,	10,575
In the hour ending 1 A.M.,	207
Passengers on trains arriving at Dudley Street:—	
In the hour ending 6 A.M.,	159
In the hour ending 6 P.M.,	17,118
Passengers on trains leaving Dudley Street, north:—	
In the hour ending 9 A.M.,	15,085
In the hour ending 1 A.M.,	197
Passengers on Cambridge subway trains:—	
Leaving Park Street, hour ending 6 A.M.,	148
Leaving Park Street, hour ending 6 P.M.,	13,272
Passengers on Cambridge subway trains:—	
Arriving at Park Street, hour ending 9 A.M.,	11,528
Arriving at Park Street, hour ending 1 A.M.,	183

APPENDIX 3.

PASSENGERS CARRIED AND CREWS REQUIRED IN EACH HOUR FOR TWENTY-FOUR HOURS, ON THE ENTIRE SURFACE SYSTEM.

HOUR OF DAY.	Passengers carried.	Number of Crews.	HOUR OF DAY.	Passengers carried.	Number of Crews.
12–1 A.M., . .	4,639	164	12–1 P.M., . .	46,245	654
1–2 A.M., . .	1,416	41	1–2 P.M., . .	46,364	664
2–3 A.M., . .	1,084	28	2–3 P.M., . .	50,592	668
3–4 A.M., . .	1,052	29	3–4 P.M., . .	54,685	692
4–5 A.M., . .	2,454	61	4–5 P.M., . .	106,453	1,117
5–6 A.M., . .	26,641	359	5–6 P.M., . .	125,358	1,389
6–7 A.M., . .	81,769	894	6–7 P.M., . .	75,722	926
7–8 A.M., . .	99,847	1,225	7–8 P.M., . .	60,087	711
8–9 A.M., . .	59,420	976	8–9 P.M., . .	38,095	564
9–10 A.M., . .	47,614	674	9–10 P.M., . .	36,764	566
10–11 A.M., . .	49,427	646	10–11 P.M., . .	37,285	586
11–12 M., . .	50,486	648	11–12 P.M., . .	18,128	447

APPENDIX 4.

PASSENGER COUNT AT NORTH STATION, BAY STATE STREET RAILWAY COMPANY.

Total for Half-hour Periods, Friday, February 20, 1914, Outbound.

TIME.	Total Passengers Carried.	Total Seats Supplied.	Seats in Excess of Passengers.	Passengers as Per Cent. of Seats.	PASSENGERS IN EXCESS OF SEATS ON INDIVIDUAL TRIPS.	
					Passengers.	Per Cent. of Total Passengers.
4.00–4.29 P.M., .	386	454	68	85.0	20	5.2
4.30–4.59 P.M., .	629	558	71[1]	112.7	145	23.1
5.00–5.29 P.M., .	894	990	96	90.3	130	14.7
5.30–5.59 P.M., .	1,111	652	459[1]	170.5	472	42.4
6.00–6.29 P.M., .	1,513	1,132	381[1]	133.7	544	36.0
6.30–6.59 P.M., .	518	674	156	76.9	59	11.4
4.00–6.59 P.M., .	5,051	4,460	591[1]	113.3	1,370	27.1

[1] Passengers in excess of seats.

APPENDIX 5.

PASSENGER COUNT AT NORTH STATION, BAY STATE STREET RAILWAY COMPANY.

Total for Half-hour Periods, Friday, February 20, 1914, Inbound.

TIME.	Total Passengers Carried.	Total, Seats Supplied.	Seats in Excess of Passengers.	Passengers as Per Cent. of Seats.	PASSENGERS IN EXCESS OF SEATS ON INDIVIDUAL TRIPS.	
					Passengers.	Per Cent. of Total Passengers.
6.30–6.59 A.M., .	285	670	385	42.5	–	–
7.00–7.29 A.M., .	581	952	371	61.0	24	4.1
7.30–7.59 A.M., .	774	1,004	230	77.1	39	5.0
8.00–8.29 A.M., .	620	916	296	67.7	15	2.4
8.30–8.59 A.M., .	608	774	166	78.5	16	2.6
9.00–9.29 A.M., .	367	608	241	60.3	–	–
6.30–9.29 A.M., .	3,235	4,924	1,689	65.8	94	2.9

APPENDIX 6.

PASSENGER COUNT AT NORTH STATION, ALL BAY STATE LINES.

Inbound during Morning Rush Hours, Friday, February 20, 1914.

TIME.	Passengers.	Seating Capacity.	Passengers in Excess of Seating Capacity.	TIME.	Passengers.	Seating Capacity.	Passengers in Excess of Seating Capacity.
6.33 A.M., . .	15	34	–	6.49 A.M., . .	20	34	–
6.33 A.M., . .	12	34	–	6.50 A.M., . .	25	40	–
6.34 A.M., . .	5	34	–	6.50 A.M., . .	18	34	–
6.34 A.M., . .	4	34	–	6.51 A.M., . .	16	40	–
6.35 A.M., . .	8	52	–	6.51 A.M., . .	17	22	–
6.42 A.M., . .	20	22	–	6.53 A.M., . .	14	34	–
6.42 A.M., . .	18	40	–	7.03 A.M., . .	30	34	–
6.42 A.M., . .	8	34	–	7.05 A.M., . .	22	40	–
6.43 A.M., . .	14	40	–	7.05 A.M., . .	20	40	–
6.45 A.M., . .	12	34	–	7.06 A.M., . .	11	34	–
6.46 A.M., . .	20	40	–	7.06 A.M., . .	6	40	–
6.48 A.M., . .	24	34	–	7.07 A.M., . .	34	40	–
6.48 A.M., . .	15	34	–	7.07 A.M., . .	16	34	–

Inbound during Morning Rush Hours, Friday, February 20, 1914 — Continued.

TIME.	Passengers.	Seating Capacity.	Passengers in Excess of Seating Capacity.	TIME.	Passengers.	Seating Capacity.	Passengers in Excess of Seating Capacity.
7.08 A.M., . .	11	40	–	7.47 A.M., . .	41	40	1
7.09 A.M., . .	32	52	–	7.47 A.M., . .	34	34	–
7.10 A.M., . .	14	22	–	7.48 A.M., . .	14	34	–
7.11 A.M., . .	19	40	–	7.49 A.M., . .	21	40	–
7.12 A.M., . .	38	34	–	7.49 A.M., . .	32	40	–
7.12 A.M., . .	19	40	–	7.49 A.M., . .	40	34	6
7.14 A.M., . .	15	40	–	7.50 A.M., . .	37	52	–
7.15 A.M., . .	31	34	–	7.52 A.M., . .	49	40	9
7.15 A.M., . .	29	34	–	7.52 A.M., . .	16	34	–
7.15 A.M., . .	8	40	–	7.52 A.M., . .	29	34	–
7.16 A.M., . .	14	40	–	7.53 A.M., . .	19	40	–
7.16 A.M., . .	14	22	–	7.54 A.M., . .	10	22	–
7.18 A.M., . .	14	34	–	7.55 A.M., . .	21	40	–
7.18 A.M., . .	30	34	–	7.56 A.M., . .	42	34	8
7.18 A.M., . .	12	22	–	7.57 A.M., . .	43	40	3
7.21 A.M., . .	44	34	10	8.02 A.M., . .	40	34	6
7.24 A.M., . .	31	40	–	8.02 A.M., . .	25	34	–
7.25 A.M., . .	30	34	–	8.03 A.M., . .	21	22	–
7.26 A.M., . .	15	32	–	8.04 A.M., . .	19	34	–
7.27 A.M., . .	32	22	10	8.04 A.M., . .	17	22	–
7.35 A.M., . .	40	40	–	8.04 A.M., . .	16	34	–
7.36 A.M., . .	45	34	11	8.06 A.M., . .	19	34	–
7.36 A.M., . .	21	40	–	8.07 A.M., . .	37	40	–
7.37 A.M., . .	31	40	–	8.07 A.M., . .	18	40	–
7.37 A.M., . .	21	34	–	8.09 A.M., . .	18	34	–
7.42 A.M., . .	15	22	–	8.09 A.M., . .	39	34	5
7.43 A.M., . .	40	40	–	8.09 A.M., . .	20	34	–
7.43 A.M., . .	35	34	1	8.09 A.M., . .	18	34	–
7.43 A.M., . .	22	34	–	8.12 A.M., . .	27	40	–
7.45 A.M., . .	18	34	–	8.12 A.M., . .	32	32	–
7.45 A.M., . .	10	34	–	8.14 A.M., . .	15	34	–
7.45 A.M., . .	10	26	–	8.15 A.M., . .	15	22	–
7.45 A.M., . .	18	34	–	8.15 A.M., . .	16	34	–

Inbound during Morning Rush Hours, Friday, February 20, 1914 — Concluded.

TIME.	Passengers.	Seating Capacity.	Passengers in Excess of Seating Capacity.	TIME.	Passengers.	Seating Capacity.	Passengers in Excess of Seating Capacity.
8.15 A.M.,	21	52	–	8.53 A.M.,	31	40	–
8.17 A.M.,	16	22	–	8.53 A.M.,	18	34	–
8.21 A.M.,	42	40	2	8.54 A.M.,	22	34	–
8.22 A.M.,	11	34	–	8.54 A.M.,	19	34	–
8.23 A.M.,	24	34	–	8.55 A.M.,	34	40	–
8.26 A.M.,	24	22	2	8.59 A.M.,	26	40	–
8.26 A.M.,	19	40	–	9.00 A.M.,	31	34	–
8.27 A.M.,	26	40	–	9.05 A.M.,	16	34	–
8.28 A.M.,	25	40	–	9.05 A.M.,	21	34	–
8.30 A.M.,	45	34	11	9.06 A.M.,	22	40	–
8.30 A.M.,	20	34	–	9.07 A.M.,	17	40	–
8.30 A.M.,	23	40	–	9.07 A.M.,	25	34	–
8.33 A.M.,	42	40	2	9.10 A.M.,	11	22	–
8.34 A.M.,	36	40	–	9.10 A.M.,	17	40	–
8.40 A.M.,	27	40	–	9.12 A.M.,	27	34	–
8.40 A.M.,	33	40	–	9.14 A.M.,	18	34	–
8.41 A.M.,	23	22	1	9.18 A.M.,	35	40	–
8.41 A.M.,	28	40	–	9.19 A.M.,	18	40	–
8.42 A.M.,	24	34	–	9.21 A.M.,	35	52	–
8.45 A.M.,	32	34	–	9.28 A.M.,	24	34	–
8.47 A.M.,	42	40	2	9.28 A.M.,	8	34	
8.47 A.M.,	36	40	–	9.29 A.M.,	26	40	
8.48 A.M.,	16	34	–	9.29 A.M.,	16	22	–
8.49 A.M.,	31	40	–	9.30 A.M.,	18	34	–

APPENDIX 7.

PASSENGER COUNT AT NORTH STATION, ALL BAY STATE LINES.

Outbound during Evening Rush Hours, Friday, February 20, 1914.

TIME.	Passengers.	Seating Capacity.	Passengers in Excess of Seating Capacity.	TIME.	Passengers.	Seating Capacity.	Passengers in Excess of Seating Capacity.
4.00 P.M., . .	20	34	–	5.04 P.M., . .	10	40	–
4.02 P.M., . .	27	40	–	5.05 P.M., . .	31	34	–
4.12 P.M., . .	50	40	10	5.05 P.M., . .	12	34	
4.14 P.M., . .	33	34	–	5.06 P.M., . .	23	34	–
4.14 P.M., . .	32	34	–	5.06 P.M., . .	14	22	
4.15 P.M., . .	26	34	–	5.08 P.M., . .	25	32	–
4.15 P.M., . .	37	52	–	5.08 P.M., . .	34	40	–
4.16 P.M., . .	21	32	–	5.16 P.M., . .	78	40	38
4.17 P.M., . .	14	34	–	5.17 P.M., . .	70	34	36
4.20 P.M., . .	41	40	1	5.18 P.M., . .	25	26	–
4.22 P.M., . .	49	40	9	5.18 P.M., . .	51	40	11
4.22 P.M., . .	36	40	–	5.19 P.M., . .	44	22	22
4.30 P.M., . .	46	34	12	5.19 P.M., . .	39	40	–
4.31 P.M., . .	43	40	3	5.20 P.M., . .	36	34	2
4.32 P.M., . .	8	40	–	5.20 P.M., . .	38	34	4
4.33 P.M., . .	40	34	6	5.20 P.M., . .	34	40	–
4.33 P.M., . .	23	34	–	5.21 P.M., . .	36	34	2
4.34 P.M., . .	25	40	–	5.22 P.M., . .	35	34	1
4.35 P.M., . .	24	40	–	5.23 P.M., . .	41	52	–
4.51 P.M., . .	75	40	35	5.23 P.M., . . .	16	34	–
4.52 P.M., . .	60	34	26	5.24 P.M., . .	19	34	–
4.55 P.M., . .	71	52	19	5.24 P.M., . .	35	40	–
4.56 P.M., . .	52	34	18	5.25 P.M., . .	27	22	5
4.56 P.M., . .	40	34	6	5.31 P.M., . .	80	40	40
4.58 P.M., . .	45	34	11	5.32 P.M., . .	72	40	32
4.59 P.M., . .	43	34	9	5.32 P.M., . .	70	34	36
4.59 P.M., . .	34	34	–	5.34 P.M., . .	65	40	25
5.00 P.M., . .	43	40	3	5.35 P.M., . .	63	34	29
5.01 P.M., . .	46	40	6	5.36 P.M., . .	42	40	2
5.01 P.M., . .	10	34	–	5.37 P.M., . .	41	22	–
5.01 P.M., . .	14	40	–	5.37 P.M., . .	45	36	9
5.02 P.M., . .	8	40	–	5.38 P.M., . .	38	34	4

Outbound during Evening Rush Hours, Friday, February 20, 1914— Concluded.

Time.	Passengers.	Seating Capacity.	Passengers in Excess of Seating Capacity.
5.38 P.M.,	44	40	4
5.39 P.M.,	28	22	6
5.40 P.M.,	34	40	–
5.41 P.M.,	25	26	–
5.42 P.M.,	34	40	–
5.54 P.M.,	90	34	56
5.57 P.M.,	90	34	56
5.57 P.M.,	90	34	56
5.58 P.M.,	85	40	45
5.58 P.M.,	75	22	53
6.03 P.M.,	85	40	45
6.04 P.M.,	65	22	43
6.04 P.M.,	85	40	45
6.04 P.M.,	80	34	46
6.06 P.M.,	85	40	45
6.09 P.M.,	100	52	48
6.09 P.M.,	60	22	38
6.10 P.M.,	70	34	36
6.11 P.M.,	75	40	35
6.12 P.M.,	64	34	30
6.14 P.M.,	52	22	30
6.14 P.M.,	68	40	28
6.15 P.M.,	65	34	31
6.16 P.M.,	60	34	26
6.17 P.M.,	37	34	3
6.17 P.M.,	43	40	3
6.18 P.M.,	35	34	1
6.19 P.M.,	34	40	–
6.19 P.M.,	32	40	–
6.20 P.M.,	36	34	2
6.21 P.M.,	33	26	7
6.22 P.M.,	25	34	–
6.23 P.M.,	21	22	–
6.24 P.M.,	21	34	–
6.25 P.M.,	33	40	–
6.26 P.M.,	8	34	–
6.26 P.M.,	42	40	2
6.27 P.M.,	21	52	–
6.28 P.M.,	7	40	–
6.28 P.M.,	23	34	–
6.28 P.M.,	18	34	–
6.29 P.M.,	30	32	–
6.30 P.M.,	23	40	–
6.31 P.M.,	32	40	–
6.31 P.M.,	10	34	–
6.36 P.M.,	52	40	12
6.37 P.M.,	19	26	–
6.37 P.M.,	27	34	–
6.38 P.M.,	25	34	–
6.38 P.M.,	4	34	–
6.39 P.M.,	15	34	–
6.40 P.M.,	24	40	–
6.46 P.M.,	60	40	20
6.50 P.M.,	39	40	–
6.51 P.M.,	50	34	16
6.52 P.M.,	45	34	11
6.53 P.M.,	28	34	–
6.53 P.M.,	10	34	–
6.56 P.M.,	12	34	–
6.57 P.M.,	9	34	–
6.58 P.M.,	30	34	–

APPENDIX 8.

SEATS FURNISHED AND PASSENGERS CARRIED, BOSTON ELEVATED RAILWAY COMPANY, FOR THE YEAR ENDING JUNE 30, 1913.

ROUND TRIPS.	Seats.	Revenue Passengers.
5,562,721 surface lines at 73.4 seats,	408,303,721	262,152,284
881,561 elevated lines at 96 seats,	84,629,856	52,902,544
247,495 Cambridge subway lines at 144 seats,	39,959,280	11,298,035
	532,892,857	326,352,863
Add one-third for seats vacated by passengers leaving cars en route,	177,630,952	218,656,418[1]
	710,523,809	545,009,281

[1] Free pass.

In this table it is estimated that the free passengers amount to 67 per cent. of the revenue passengers as shown in table, and it is also assumed that one-third should be added to the total number of seats furnished to represent seats made available for new passengers by passengers who have left the cars during the earlier portion of the route.

STATEMENT OF PASSENGERS CARRIED AND SEAT HOURS AVAILABLE, BAY STATE STREET RAILWAY COMPANY.

PERIOD.	Passengers.	Seat Hours Available.
Year ending June 30, 1913,	212,272,279	328,877,810
Month of August, 1913,	23,449,899	43,914,050
Month of January, 1914,	15,663,358	71,825,860
Week ending: —		
July 5, 1913 (maximum summer week),	5,809,831	9,916,080
Dec. 27, 1913 (maximum winter week),	3,945,171	4,025,190
Sept. 1, 1913 (maximum summer day),	1,190,943	1,416,580
Dec. 20, 1913 (maximum winter day),	679,118	575,030
5 to 6 P.M. Jan. 22, 1914 (rush hour),	59,490	32,930

Seat hours available are computed by the formula Seat hours = seats x 18 hours x days x .97 of cars. It is assumed that 3 per cent. of cars or seats are in shops, except on figure for rush hour; in other words, the last column gives the total number of seats available in the cars of this company, assuming that the entire traffic takes place between 6 A.M. and midnight, and assuming that each passenger rides one hour on the average. Taking any one day, more seats are offered than there are passengers. Probably each passenger rides less than an hour on the average, making the number of seats available for passengers still greater.

APPENDIX 9.

STATEMENT OF FARE REDUCTIONS, EXTENSION OF FARE LIMITS AND TRANSFER PRIVILEGES, BAY STATE STREET RAILWAY COMPANY, BETWEEN JANUARY 1, 1900, AND SEPTEMBER 30, 1913.

January 1, 1900.— Local transfer privileges granted in Wakefield, Reading and Stoneham.

January 3, 1900.— School ticket (half rate) introduced between Revere and Chelsea High School.

January 15, 1900.— Five cent fare limit extended between Peabody Square and Peabody–Lynnfield line to Lynnfield Hotel.

January 15, 1900.— Five cent fare limit between Wakefield Town Hall and Melrose Highlands extended to Melrose City Hall.

January 25, 1900.— Local transfer privileges granted in Gloucester.

February 5 to 21, 1900.— School tickets (half rate) introduced in Peabody, Swampscott, Lynn, Saugus, Melrose, Stoneham, Malden, Woburn, Marblehead and Salem.

February, 1900.— Fare between Salem and Asbury Grove reduced from 15 cents to 10 cents.

February 23, 1900.— Five cent fare limit between Annisquam and Centre Street, Gloucester, extended to junction of Spring and Main streets.

February 27, 1900.— Workingmen's tickets (half rate) introduced between Marblehead and Lynn. Good on week days between 6 and 7 A.M. and 6 and 7 P.M.

March 6, 1900.— Fare between Wakefield and Lynn reduced from 15 cents to 10 cents.

March 6, 1900.— Fare between Wakefield Town Hall and Melrose City Hall extended to boundary line between Melrose and Malden.

March 6, 1900.— Fare reduced from Beverly–Wenham line to Town House Square, Salem, from 10 cents to 5 cents. Local transfer in Beverly granted.

March 6, 1900.— Local transfers granted in town of Peabody and cities of Woburn and Melrose.

March 6, 1900.— Additional transfer privileges granted in Lynn from the Lynn–Saugus line.

March 27, 1900.— Transfer privileges on the Malden and Melrose line extended from Melrose Highlands to the Melrose–Wakefield line and from Malden Square to the Malden–Everett line.

May, 1900.— Five cent fare limit between Malden Square and Cliftondale extended to East Saugus.

May 28, 1900.— Five cent fare limit between Rocky Neck, Gloucester, and railroad crossing on Washington Street extended to Green Turnout on Washington Street.

July 14, 1900.— Five cent fare limit extended between Revere–Saugus line and Saugus Center to Saugus–Melrose line.

August 3, 1900.— Five cent fare limit between Lynn and North Saugus extended to the Saugus–Wakefield line.

August, 1900.— School tickets (half rate) placed on sale in all cities and towns.

September 19, 1900.— Transfer limits extended on Washington Street route in Lynn to Lynn Woods.

October 3, 1900.— Joint transfer granted locally in Ipswich with the Georgetown, Rowley & Ipswich Company.

October 8, 1900.— Workingmen's tickets (half rate) introduced between Central Square, Lynn, and Town House Square, Salem. Good on week days between hours of 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M.

October 8, 1900.— Workingmen's tickets (half rate) introduced between Central Square, Lynn, and Marblehead.

November 22, 1900.— Fare between transfer limits in Lowell and transfer limits in Lawrence reduced from 20 cents to 15 cents.

November 22, 1900.— Workingmen's tickets introduced between Haverhill and West Newbury, reducing fare from 10 cents to 7½ cents.

1900.— Workingmen's tickets (half rate) introduced between Gloucester and Lanesville. Good on week days between 6 and 7 A.M. and 6 and 7 P.M.

January 1, 1901.— Transfer privileges granted between the Woburn-Reading and Woburn-Stoneham routes from junction of Salem and Bow streets and Woburn Square.

January 1, 1901.— Transfer privileges extended between Peabody-Salem line and Salem-Marblehead line to Marblehead.

January 21, 1901.— Transfer privileges extended between Wakefield Town Hall and Melrose Highlands to the Melrose-Stoneham line.

March 2, 1901.— Local transfer privileges in Salem extended to Beverly Depot, Beverly, and Peabody Square, Peabody.

March, 1901.— Workingmen's tickets (half rate) introduced between Marblehead and Central Square extended to Market Square, Lynn.

March 30, 1901.— Transfer privileges in Reading extended to Overhead Bridge, Grove Street, on Wilmington route.

April 13, 1901.— Transfer privileges in Beverly extended to the former Beverly and Danvers line within Beverly town limits; also transfer privileges in Danvers extended to same line.

April 14, 1901.— Transfer privileges granted to passengers from Scollay Square from cars on other routes to Washington Avenue and Broadway lines.

April 30, 1901.— Local transfer limits in Lowell extended from Kenwood to Varnum's Landing on the Lowell-Lawrence route.

May 6, 1901.— Transfer privileges in Woburn extended to the former North Woburn line within Woburn city limits.

May 10, 1901.— Local transfer privileges granted in Billerica.

May 10, 1901.— Fare between Billerica Center and Wilmington Center reduced from 10 cents to 5 cents.

May 10, 1901.— The fare from Wilmington Center to Woburn Center was reduced from 10 cents to 5 cents.

May 10, 1901.— The fare between any part of Stoneham and Arlington was reduced from 10 cents to 5 cents.

May 10, 1901.— The fare between any part of Stoneham and Medford was reduced from 10 cents to 5 cents.

May 10, 1901.— The fare between any part of Woburn and Arlington was reduced from 10 cents to 5 cents.

May 10, 1901.— The fare between any part of Woburn and Medford was reduced from 10 cents to 5 cents.

May 10, 1901.— Local transfer privileges granted in the town of Winchester.

June 10, 1901.— Joint transfer issued by the Middleton and Danvers and this company to enable passengers to reach Danvers Square from Middleton for 5 cents.

June 10, 1901.— Fare from Putnamville to Town House Square, Salem, via Peabody, reduced from 8 cents to 5 cents.

June 10, 1901.— Fare between Hawthorne Station, Danvers, and Town House Square, Salem, reduced from 8 cents to 5 cents.

June 10, 1901.— Fare between Danvers Center and Town House Square, Salem, via Danversport, reduced from 8 cents to 5 cents.

June 19, 1901.— Transfer privileges granted in Lynn between the Belt Line and the Lynn & Salem, Lynn & Marblehead and Nahant Beach routes.

July 10, 1901.— Joint transfer issued by the Lawrence & Reading and this company, extending the 5 cent fare from North Reading Junction to end of Lawrence & Reading route to Elm Square, Andover.

August 28, 1901.— Transfer privileges between the Danvers-Beverly and Beverly-Salem line extended to Town House Square, Salem.

August 28, 1901.— Local transfer privileges in Salem from the Beverly-Salem line extended to Marblehead.

September 7, 1901.— Fare reduced from any part of Wilmington to Woburn Square, from 10 cents to 5 cents.

September 20, 1901.— Transfer privileges in Salem extended from Salem–Swampscott line to Marblehead.

September 20, 1901.— Transfer privileges in Danvers extended from Danvers–Salem line, Danversport, to Town House Square, Salem.

September, 1901.— Workingmen's tickets between Lanesville and Centre Street, Gloucester, extended to Spring Street, Gloucester.

October 4, 1901.— Transfer privileges from Woburn–Reading line extended from Stoneham–Woburn line to Stoneham Square.

October 16, 1901.— Joint transfer privilege with the Lawrence & Reading Street Railway Company granted to establish a 5 cent fare between Reading–North Reading line and Reading Depot.

October 18, 1901.— Transfer privileges granted in Salem from Beverly–Salem line to Salem–Peabody line, via Boston Street.

October 29, 1901.— Five cent fare limit between Wilmington and Woburn Square extended to Woburn–Winchester line.

November 20, 1901. — Transfer privileges in Revere and Chelsea extended from Everett–Malden line to Malden–Melrose line.

December 21, 1901. — Transfer privileges to passengers from Boston extended to all lines from Broadway in Revere and to Lebanon Street, Maplewood.

December 21, 1901.— Transfer privileges granted from Highland Circuit route, Lynn, to Lynnhurst, and from Myrtle Street and Walnut Street routes to Lynn–Peabody line.

January 7, 1902.— Local transfer limits in Lowell extended from Lowell–Tewksbury line to "Red village" in Tewksbury.

January 23, 1902.— Transfer privileges granted from Woodlawn Cemetery, Everett, to Lebanon Street, Maplewood.

January 31, 1902.— Local transfer privileges granted in Wilmington.

February 13, 1902.— Transfer privileges granted in Malden to Boston passengers from Malden Square to Western Division Depot.

March 8, 1902.— Transfer privileges granted from Belt Line route, Lynn, to Revere–Chelsea line.

April 23, 1902.— Five cent fare limit to Centre Street, Gloucester, extended from Saw Mill Hill Turnout to Conomo Road (Harlow Street).

April 29, 1902.— Workingmen's tickets between Haverhill and West Newbury reduced from 7½ cents to 5 cents.

May 19, 1902.— Transfer privilege between Reading Depot and Reading–North Reading line extended to North Reading.

July 9, 1902.— Workingmen's tickets (half rate) introduced between Danvers Center and Beverly, Hathorne and Beverly, Putnamville and Beverly, Danvers Center and Peabody, Hathorne and Peabody. Good on week days between 6 and 7.30 A.M. and 5 and 6.30 P.M.

August 11, 1902.— Five cent fare limit to Lanesville extended to Gloucester–Rockport line.

August 11, 1902.— Five cent fare limit to Pigeon Cove extended to Rockport–Gloucester line.

August 30, 1902.— Fare between Hathorne Station, Danvers, and Town House Square, Salem, reduced from 10 cents to 5 cents.

September, 1902.— Fare between Danvers Center, Hathorne Station or Putnamville and Peabody Square or Beverly reduced by sale of tickets (10 rides for 50 cents) from 10 cents to 5 cents.

October 26, 1902.— General local transfer introduced in Lynn to all 5 cents limits.

November 3, 1902.— Workingmen's tickets (half rate) introduced between Danvers Center or Hathorne Station and Salem–Marblehead line. Good on week days between 6 and 7.30 A.M. and 5 and 6.30 P.M.

November 6, 1902.— Transfer privileges in Woburn extended from Woburn–Stoneham line to Stoneham Square.

November 19, 1902.— Fare from Cliftondale to Scollay Square, Boston, reduced from 7 cents to 5 cents.

November 24, 1902.— Workingmen's tickets between Central Square, Lynn, and Chelsea Square, Chelsea, made good on Saturdays between 12 and 1 o'clock P.M.

March 11, 1903.— Transfer privilege between Lynn–Saugus line and Malden Square extended to Western Division Depot, Malden, and from Melrose Highlands to Main and Essex streets, Melrose.

March 16, 1903.— Five cent fare limit from Rocky Neck to Green Turnout extended to Bridgewater Street, Annisquam. Five cent fare limit from Bridgewater Street, Annisquam, to Spring Street, Gloucester, extended to Rocky Neck, Gloucester.

June 11, 1903.— Local transfer privilege in Stoneham extended to Reading Square, Wakefield Square and Woburn Square.

July 4, 1903.— Local transfer privileges granted in Andover.

August 24, 1903.— Local transfer privileges granted in town of North Andover.

August 24, 1903.— Local transfer privileges extended in Danvers to the former Middleton & Danvers Company's lines.

August 31, 1903.— Fare between Middleton–Danvers line and Town House Square, Salem, reduced from 10 cents to 5 cents.

September 2, 1903.— Workingmen's tickets between West Lynn and Marblehead made good on Saturdays between 12 and 1 o'clock P.M.

October 5, 1903.— Local transfer privileges in Danvers extended to Danvers–Middleton line and to Cabot and Bow streets, Beverly.

October 5, 1903.— Reduced rates ticket privileges between Danvers and Peabody extended to Beverly–Danvers line and Danvers–Peabody line on Water Street.

October 22, 1903.— Workingmen's tickets (half rate) introduced between Woburn–Stoneham line and Central Square, Lynn. Good on week days between 5.30 and 7.30 A.M. and 4.45 and 6.30 P.M.

January 30, 1905.— Workingmen's tickets between West Newbury and Haverhill introduced, reducing fare from 10 cents to 7 cents. Good on week days between 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M.

February 20, 1905.— Workingmen's tickets between Groveland–West Newbury line and Newburyport introduced, reducing fare from 15 cents to 10½ cents. Good on week days between 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M.

February 20, 1905.— Workingmen's tickets between Town Hall, West Newbury, and Newburyport introduced, reducing fare from 10 cents to 7 cents. Good on week days between 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M.

April, 1905.— Workingmen's tickets introduced between Middleton and Salem, reducing fare from 10 cents to 7 cents. Good on week days between 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M.

April, 1905.— Workingmen's tickets between Essex and Salem introduced, reducing fare from 15 cents to 10½ cents. Good on week days between 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M.

April, 1905.— Special tickets between Beverly and Essex introduced, reducing fare from 15 cents to 10 cents.

April, 1905.— Special tickets between Gloucester and Essex introduced, reducing fare from 15 cents to 10 cents.

August 26, 1905.— Use of workingmen's tickets between Lynn and Chelsea and between West Lynn and Marblehead extended to include the hour between 12 noon and 1 P.M. Saturdays.

August 28, 1905.— Fare between town of Middleton, north of Middleton Square, and Salem reduced from 15 cents to 10 cents.

October 21, 1905.— Special tickets between Lowell and Billerica Center introduced, reducing fare from 10 cents to 7½ cents.

October 21, 1905.— Special school tickets between Lowell and Billerica Center introduced, reducing school fare from 5 cents to 3¾ cents.

October 24, 1905.— Workingmen's tickets between Beverly and Essex introduced, reducing fare from 10 cents to 7½ cents. Good on week days between 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M.

October 24, 1905.— Workingmen's tickets between Gloucester and Essex introduced, reducing fare from 10 cents to 7½ cents. Good on week days between 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M.

October 24, 1905.— Special tickets between Beverly and Essex introduced, reducing fare from 15 cents to 10 cents.

October 24, 1905.— Special tickets between Gloucester and Essex introduced, reducing fare from 15 cents to 10 cents.

November 21, 1905.— Fare between Malden–Everett line and Melrose City Hall reduced from 10 cents to 5 cents.

December 17, 1905.— Fare between Middleton, south of Middleton Square, and Lawrence reduced from 20 cents to 15 cents.

March 6, 1906.— Workingmen's tickets between Lynn and Wakefield introduced, reducing fare from 10 cents to 7 cents. Good on week days between 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M.

March 30, 1906.— Transfer privilege to Reading Square extended to cash passengers boarding cars between Perry's Corner and Wilmington Depot.

May 29, 1906.— Workingmen's tickets between Town Hall, West Newbury, and Haverhill extended from Town Hall, West Newbury, to Indian River, West Newbury, 7 cents.

May 29, 1906.— Workingmen's tickets between West Newbury–Newburyport line and Haverhill made good at all hours, Sundays included; 10½ cents.

June, 1906.— Workingmen's tickets between Beverly and Hamilton introduced, reducing fare from 10 cents to 7½ cents. Good on week days between 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M.

June 9, 1906.— Transfer privileges in Lowell extended from junction Talbot and Juniper streets to South Lowell; from Wigginsville Turnout to Sprague's residence; from Atherton Village to Lowell–Tewksbury line.

June 20, 1906.— Special tickets between local fare limit west of West Newbury–Newburyport line and Haverhill introduced, reducing fare from 15 cents to 10 cents.

July 5, 1906.— Workingmen's tickets between Central Square, Lynn, and a point formerly known as Vaughn's machine shop, Lynnfield Street, Peabody, introduced, reducing fare from 10 cents to 5 cents. Good on trips leaving Central Square, Lynn, at 5.45 A.M. and machine shop at 5.05 P.M. week days, and on Saturdays leaving machine shop at 12.35 P.M.

July 9, 1906.— Workingmen's tickets between Lynn and Salem introduced, reducing fare from 10 cents to 7 cents. Good on week days between 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M.

March, 1907.— Workingmen's tickets between Gloucester and Lanesville–Rockport line introduced, reducing fare from 10 cents to 5 cents. Good on week days between 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M.

May, 1907.— Workingmen's tickets between Lynn and Salem made good between the hours of 12 noon and 1 P.M. Saturdays.

June 7, 1907.— Transfer privilege to Melrose City Hall extended to include cash passenger boarding cars between Revere–Malden line and Lebanon Street.

June 7, 1907.— Transfer privilege in Malden extended from Lebanon Street to Malden–Revere line.

June 13, 1907.— Workingmen's tickets between Lynn and Salem extended to include 7.37 A.M. trip, week days, from Salem.

June 24, 1907.— Workingmen's tickets between Gloucester and Lanesville–Rockport line extended to include 4.20 P.M. trip, week days, from Gloucester.

May 30, 1908.— Fare between Woburn Center and Burlington line extended from Burlington line to Pinehurst Park during June, July, August and September.

June 22, 1908.— Special tickets between Cliftondale and Stoneham introduced, reducing fare from 15 cents to 10 cents.

August 14, 1909.— Local fare of 5 cents established between Lawrence–Methuen line and Methuen–Dracut line.

December 15, 1910.— Workingmen's tickets between Lynn and junction Park Avenue and Dale Street, Revere, introduced, reducing fare from 10 cents to 7 cents. Good on Saturdays between 12 noon and 1 P.M. and on other week days between 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M.

January 23, 1911.— Workingmen's tickets between Lynn and North Saugus introduced, reducing fare from 10 cents to 5 cents. Good on Saturdays from 12 noon to 1 P.M. and other week days from 5.30 to 7.30 A.M. and 4.30 to 6.30 P.M.

May 28, 1911.— Workingmen's tickets between Lynn and Woburn-Stoneham line made good between 4.30 and 6.30 P.M., instead of 4.45 to 6.30 P.M.

January 6, 1912.— Transfer privilege in Tewksbury during workingmen's hours extended from Tewksbury Center to Chandler Street.

July 18, 1912.— Local fare and transfer limit in Lawrence extended from junction of Lowell Road and private way to "Stanleys."

August 1, 1912.— Local fare limit and morning and afternoon transfer privilege in North Billerica extended from Polland Rock to High Street.

August 19, 1912.— Transfer privileges in Lynn extended from Lynnhurst to North Saugus schoolhouse.

September 3, 1912.— Workingmen's tickets between Post Office Square, West Newbury, and Haverhill introduced, reducing fare from 7 cents to 5 cents. Good week days between 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M.

May 1, 1913.— Salem local transfer limit extended from Beverly Depot and Cabot and Bow streets to Gloucester Crossing.

August 19, 1913.— Local fare and transfer limit in Melrose extended from junction of Goodyear Avenue and Main Street to junction of Main and Sylvan streets.

September 28, 1913.— Special tickets between local fare limit north of North Andover-Middleton line and Lawrence introduced, reducing fare from 15 cents to 10 cents.

Brockton.— Lines of five companies, viz., Brockton, Brockton, Bridgewater & Taunton, Brockton & East Bridgewater, Taunton & Brockton, South Shore & Boston, consolidated, and universal free transfer for a single fare good between any two points in the city.

Taunton.— Lines of three companies, viz., Taunton, Providence & Taunton, Dighton, Somerset & Swansea, consolidated, and universal free transfer for a single fare introduced.

Dedham.— Lines of three companies, viz., Norfolk Suburban, West Roxbury & Roslindale, Norfolk Central, consolidated, with same result as in Brockton and Taunton relative to free transfers.

Quincy.— In this city was the Quincy & Boston Street Railway Company, with numerous lines converging at the center of the city, and the only transfer system from one line to another was by means of an 8 cent check. This company has been merged into the Brockton, and a universal 5 cent free transfer system introduced.

In each of the following towns, as a result of consolidations already accomplished, free transfer privileges upon payment of a single fare have been introduced from the lines of one former company to those of another, viz.: —

Weymouth.— Brockton, succeeding the Quincy & Boston Street Railway Company and the South Shore & Boston Street Railway Company.

Whitman.— Brockton Street Railway Company, South Shore & Boston Street Railway Company.

Bridgewater.— Lines of three companies, viz., New Bedford, Middleborough & Brockton, South Shore & Boston, Brockton, consolidated.

East Bridgewater.— Lines of two companies, viz., Brockton, South Shore & Boston, consolidated.

Randolph.— Lines of three companies, viz., Boston, Milton & Brockton, Brockton, Quincy & Boston, consolidated.

Braintree.— Lines of three companies, viz., Quincy & Boston, Brockton, South Shore & Boston, consolidated.

Weymouth.— Fare between Bowker Fertilizer Works and city of Quincy reduced from 10 cents to 5 cents.

Somerset.— Fare between Pottersville & Fall River reduced from 10 cents to 5 cents.

Needham.— Fare between Needham and Forest Hills reduced from 10 cents to 5 cents.

Holbrook.— Fare between Holbrook and Brockton reduced from 10 cents to 5 cents.

Neponset Bridge.— Boston to Brockton via Braintree and Holbrook, fare reduced from 25 cents to 20 cents. Boston to Brockton via Braintree, Randolph and Avon, fare reduced from 25 cents to 20 cents.

NOTE.— This reduction between Boston and Brockton, in conjunction with the transfer privilege in Brockton, has resulted in a saving of 10 cents to passengers between Boston and points south of Brockton.

Forest Hills, Boston, and Dedham.— To Quincy, fare reduced 5 cents.

January 31, 1902.— Five cent fare introduced between Oakdale and Forest Hills via Hyde Park. Five cent fare introduced between Oakdale and Milton Lower Mills.

June 1, 1902.— Five cent fare limit from Randolph to Brockton extended from Gifford schoolhouse to Highland Park.

July 11, 1902.— Five cent fare introduced between Goward's Corner, South Easton, and Brockton, between the hours of 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M., Sundays and holidays excepted.

July 11, 1902.— Tickets introduced between Goward's Corner, South Easton, and Brockton, reducing fare from 10 cents to 7½ cents.

March 30, 1903.— The fare between Rockland Depot and Stetson & Heald's factory, Weymouth, reduced from 10 cents to 5 cents on 6.30 A.M. trip from Rockland Depot and on 5 P.M. trip from Stetson & Heald's factory.

December 24, 1903.— Transfer privileges in Dedham extended to the Needham-Dedham town line.

July 15, 1904.— Transfer privilege granted in Nantasket to Surfside.

December 7, 1904.— Transfer privilege in Hyde Park extended to Milton Lower Mills.

February 20, 1905.— Workingmen's tickets introduced between Scotland Center and Brockton transfer limits, reducing fare from 15 cents to 10½ cents between 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M. week days.

June, 1905.— Special tickets between Lakeville Junction and Middleborough introduced, reducing fare from 10 cents to 7 cents.

June, 1905.— Special tickets between Taunton and Shaw's Corner, Raynham, introduced, reducing fare from 7½ cents to 7 cents.

June, 1905.— Workingmen's tickets between Taunton and Raynham-Easton line introduced, reducing fare from 7½ cents to 7 cents between hours of 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M. week days.

July 3, 1905.— Fare between North Raynham post office and City Square, Taunton, reduced from 7½ cents to 5 cents.

November 1, 1905.— Fare between Braintree Depot and Brockton-Holbrook line reduced from 15 cents to 10 cents.

December 18, 1905.— Five cent local fare between Braintree Depot and Holbrook Square extended to Adams and Franklin streets, Holbrook.

June, 1906.— Workingmen's tickets introduced between Whitman and Brockton, reducing fare from 7½ cents to 7 cents between hours of 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M. week days.

June, 1906.— Workingmen's tickets introduced between Randolph and Milton Lower Mills, reducing fare from 7½ cents to 7 cents between hours of 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M. week days.

June, 1906.— Workingmen's tickets between Rockland and Brockton introduced, reducing fare from 7½ cents to 7 cents between hours of 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M. week days.

June, 1906.— Workingmen's tickets between Bridgewater and Brockton introduced, reducing fare from 7½ cents to 7 cents between hours of 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M. week days.

June 12, 1906.— Workingmen's tickets introduced between Bridgewater Center and the Lakeville-Middleborough line, reducing fare from 15 cents to 10½ cents between hours of 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M. week days.

July 3, 1906.— Special tickets introduced between Rockland Center and Queen Ann's Corner, reducing fare from 10 cents to 7 cents.

July 18, 1906.— Fare between North Middleborough post office and Bridgewater Center reduced from 10 cents to 5 cents.

December 24, 1906.— Special tickets, used jointly with the Dartmouth & Westport Street Railway Company, introduced between Sanford Road, Westport, and Fall River city limits, reducing fare from 10 cents to 5 cents.

March 1, 1907.— Special tickets introduced between Middleborough and Lakeville, reducing fare from 7 cents to 5 cents.

May, 1907.— Workingmen's tickets between Brockton and Easton introduced, reducing fare from 7½ cents to 7 cents between hours of 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M. week days.

May, 1907.— Workingmen's tickets between Brockton and East Bridgewater introduced, reducing fare from 7½ cents to 7 cents between hours of 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M. week days.

May, 1907.— Special tickets between Rockland and Queen Ann's Corner introduced, reducing fare from 7 cents to 5 cents.

May 28, 1907.— Special tickets between Quincy Square and Nantasket Beach introduced, reducing fare from 20 cents to 15 cents. Good June, July, August and September.

June 10, 1907.— Workingmen's tickets introduced between City Square, Taunton and Bridgewater Center, reducing fare from 15 cents to 10 cents between hours of 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M. week days.

January 22, 1908.— School tickets introduced between Rockland Center and Queen Ann's Corner, reducing school fare from 5 cents to 2½ cents.

August 1, 1911.— Workingmen's tickets introduced between Weymouth and Rockland or North Abington, reducing fare from 10 cents to 7 cents between hours of 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M. week days.

August 1, 1911.— Fare between Rockland Depot and Stetson & Heald's Factory, Weymouth, reduced from 10 cents to 5 cents on 12.30 P.M. trip from Rockland Depot, Saturdays.

November 6, 1911.— Fare between East Bridgewater Center and Center Street, Brockton, reduced from 10 cents to 5 cents between hours of 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M. week days.

February 3, 1913.— Fare between Brewer's Corner, Quincy, and Milton Lower Mills reduced from 10 cents to 5 cents on 6.25 A.M. trip from Brewer's Corner and 12 M. trip Saturdays; 6 P.M. trip other week days from Milton Lower Mills.

May 1, 1913.— Five cent fare between Brockton and Goward's Corner, Easton, between the hours of 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M. extended to Alger's Corner, Easton.

May 1, 1913.— Special ticket privilege between Brockton and Goward's Corner, Easton, extended to Alger's Corner, Easton.

December 1, 1913.— Workingmen's tickets introduced between Brockton and Raynham, reducing fare from 15 cents to 10½ cents between hours of 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M. week days.

Workingmen's tickets between Holbrook and Brockton introduced, reducing fare from 7½ cents to 7 cents between hours of 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M. week days.

Workingmen's tickets between North Abington and South Weymouth introduced, reducing fare from 10 cents to 5$\frac{15}{16}$ cents between hours of 5.30 and 8 A.M. and 4 and 6.30 P.M. week days.

Special tickets between Liberty Street, Randolph, and Brockton introduced, reducing fare from 10 cents to 7½ cents.

Special tickets between Stoughton and Brockton introduced, reducing fare from 10 cents to 7½ cents.

Special tickets between North Easton and Brockton introduced, reducing fare from 10 cents to 7½ cents.

Workingmen's tickets introduced between Taunton and Fall River-Somerset line, where fare is 10 cents or more, reducing fare 25 cents, holidays and Sundays excepted; good for any ten days during any calendar month.

Special 54-ride tickets between Fall River and Slade's Ferry Bridge and Johnny's Hill, Somerset, introduced, reducing fare from 5 cents to 3⅓ cents; good only if used within one month of date of issue.

Fare between Liberty Street, Randolph, and Brockton Center, between hours of 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M., Sundays excepted, reduced from 10 cents to 5 cents.

Fare between Stoughton and Brockton Center, between hours of 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M., Sundays excepted, reduced from 10 cents to 5 cents.

Fare between North Easton and Brockton Center, between hours of 5.30 and 7.30 A.M. and 4.30 and 6.30 P.M., Sundays excepted, reduced from 10 cents to 5 cents.

Fare between West Bridgewater Monument and Elmwood reduced from 10 cents to 5 cents.

Fare between Randolph Square and Braintree Depot reduced from 10 cents to 5 cents.

Fare between Green Hill and Nantasket Point reduced from 10 cents to 5 cents.

Fare between No. 1 school, Randolph, and Milton Lower Mills reduced from 15 cents to 10 cents.

APPENDIX 10.

INSTANCES WHERE FARES WERE INCREASED, BAY STATE STREET RAILWAY COMPANY.

June 30, 1903.— Needham and Boston route: Five-cent fare between Needham and Forest Hills on inception of lease of Old Colony lines to Boston Elevated Railway Company changed to establish a 5 cent fare between Needham and junction of Spring and Centre streets, West Roxbury, resulting in an increase of fare between Needham and Forest Hills from 5 cents to 10 cents.

August 15, 1904.— Rate of fare between Merrimack Square, Lowell, and Nashua, N. H.: Transfer limits increased from 15 cents to 20 cents.

January 1, 1905.— Rate of fare between Brockton transfer limits and Lund's Corner, New Bedford, increased from 30 cents to 45 cents.

January 15, 1905.— Rate of fare between Boston & Maine Depot, Haverhill, and Market Square, Newburyport, increased from 15 cents to 20 cents.

April 9, 1905.— Rate of fare between junction of Essex Street and Broadway, Lawrence, and Town House Square, Salem, increased from 20 cents to 25 cents.

April 9, 1905.— Rate of fare between Danvers Center or Hathorne Station, Danvers, and Salem–Marblehead line increased from 8 cents to 10 cents.

April 23, 1905.— Rate of fare between Centre Street, Gloucester, and junction of Cabot and Bow streets, Beverly, with transfer privileges in Gloucester and Beverly, increased from 20 cents to 25 cents.

June 9, 1905.— Rate of fare between Brockton transfer limits and Nantasket Beach increased from 25 cents to 30 cents.

June 9, 1905.— Rate of fare between Neponset and Nantasket Beach increased from 15 cents to 20 cents, except between Quincy Square and Nantasket Beach, for which 15 cents fare was provided by means of special ticket.

June 9, 1905.— Rate of fare between Neponset and Brockton transfer limits increased from 15 cents to 20 cents.

September 5, 1905.— Rate of fare between Merrimack Square, Lowell, and Billerica Center increased from 5 cents to 10 cents, or by commutation ticket to 7½ cents.

October 24, 1905.— Transfer privileges in Gloucester and in Beverly to through passengers between Centre Street, Gloucester, and junction of Cabot and Bow streets, Beverly, withdrawn, resulting in an increased rate of fare between Gloucester transfer limits and Beverly transfer limits from 25 cents to 35 cents.

November 13, 1905.— Rates of fare in and between points in Reading, Wakefield, Stoneham, Melrose and Saugus and at Malden Square equalized so as to establish a 5 cent fare limit between the center of any one of said city and towns and the limits of any adjoining city or town except Malden, between Wakefield Square and Malden Square, between Stoneham Square and Malden Square and between Melrose city limits and Malden Square. Rate of fare between Melrose city limits and Scollay Square, Boston, increased from 5 cents to 10 cents, or by commutation ticket to 7½ cents. Rate of fare between Reading town limits and Scollay Square, Boston, increased from 10 cents to 15 cents. Rate of fare between Stoneham town limits and Scollay Square, Boston, increased from 10 cents to 15 cents.

APPENDIX 11.

STATISTICS OF OPERATION OF BOSTON ELEVATED RAILWAY SYSTEM AT FIVE-YEAR INTERVALS, FROM 1888 TO 1913.

	1888.	1893.	1898.	1903.	1908.	1913.
Miles of single track operated,	231	268	316	437	474	510,988
Capital invested, including leased lines, subways and tunnels,	$11,639,711 97	$22,487,528 99	$31,535,545 33	$47,823,459 21	$66,829,739 00[1]	$105,684,148 59
Gross earnings,	$4,887,737 62	$6,692,578 07	$9,257,252 94	$12,019,371 26	$14,074,696 51	$16,968,328 33
Ratio of capital to gross earnings,	2.3875	3.3601	3.4065	3.9788	4.7482	6.22
Revenue passengers,	97,039,269	133,863,618	181,321,295	233,563,578	273,132,584	326,352,863
Revenue passengers carried per dollar of investment,	8.39	5.90	5.07	4.88	4.10	3.09
Revenue at 5 cent fare per $1 invested (cents),	41	29.7	28.7	24.4	20.4	15.4
Car miles run,	15,415,802	18,669,809	32,209,150	47,476,702	51,625,143	57,784,319
Earnings per car mile, all kinds of cars (cents),	31.7[2]	35.8[2]	28.7[3]	25.3[3]	27.3[3]	28.3[3]
Free transfer passengers,	–	11,204,752	28,618,600	130,000,000	159,514,502	218,716,158[4]
Transfer passengers per cent. of revenue passengers,	–	8.37	15.78	55.65	58.40	67
Average fare per revenue passenger carried (cents),	4.96	4.94	4.95	4.99	4.99	4.991
Average fare per total passenger carried (cents),	–	4.55	4.27	3.21	3.15	2.9
Operating expenses,	$3,830,326 67	$4,550,734 68	$6,566,584 16	$8,259,860 49	$9,454,385 83	$11,135,581 18
Maintenance,	665,103 06	1,039,699 07	1,763,978 94	1,583,177 28	2,286,915 90	3,044,498 72
Taxes,	133,269 22	321,501 68	602,227 27	917,019 44	985,318 90	1,128,021 51
Dividends, West End,	473,321 67	1,329,650 00	–	–	–	–
Dividends, West End, paid as part of rental,	–	–	1,147,950 00	1,163,848 75	1,270,840 96	1,392,968 51
Dividends, Elevated,	–	–	112,500 00	798,000 00	798,000 00	1,197,000 00
Interest on bonds and other debts,	196,079 89	356,288 08	498,600 00	644,615 76	1,016,417 34	1,858,116 95
Rentals of subways, tracks, depreciation, etc.,[5]	8,415 00	11,989 08	115,314 35	207,072 24	507,669 74	693,017 19
Surplus,	379,112 15	179,861 01	214,077 00	28,954 00	42,063 00	496,377 00[6]

---

[1] Does not include the Washington Street Tunnel, as the figures are for fiscal years to September 30, and that tunnel was not opened until November 30, 1908.

[2] Surface cars only.

[3] Surface and elevated cars.

[4] Estimated at 67 per cent. of revenue passengers.

[5] Does not include rental of West End Street Railway.

[6] Deficit.

APPENDIX 12.

INVESTMENT FOR ROAD OWNED AND LEASED, BOSTON ELEVATED RAILWAY COMPANY, JUNE 30, 1913.

Boston Elevated Railway Company.

Original elevated, Sullivan Square to Dudley Street,	$15,638,260 82
Forest Hills extension,	2,967,822 65
East Cambridge extension,	3,429,117 81
Malden and Everett extension,	798,961 36
Cambridge, Main Street Subway (construction),	7,073,632 66
Eliot Square terminal for Cambridge Subway,	1,037,996 99
Equipment of Cambridge Subway,	321,228 24
Cambridge bridge and payment on account of bridge,	630,147 22
Washington Street Tunnel, including cost of approaches,	1,545,357 44
East Boston Tunnel,	249,772 72
Beacon Hill Tunnel and approach,	435,457 56
Dorchester Tunnel,	43 02
General expenditures for miscellaneous land and buildings, power stations, surface tracks owned by Boston Elevated shops, car equipment, line equipment, etc.,	12,517,868 48
Boylston Street Subway,	98 95
Total Boston Elevated permanent investment (exclusive of $500,000 deposited with State, according to Acts of 1894 and 1897),	$46,645,590 03

West End Street Railway Company.

Amount reported to Railroad Commissioners June 30, 1913,			$39,248,530 99
Amount due Boston Elevated for permanent improvements per unsettled bills,			1,223,722 62
December, 1912,	$549,828 91		
June, 1913,	610,984 21		
		$1,160,813 12	
West End suspense account for items held in abeyance,		62,909 50	
Total West End Street Railway Company property,			$40,472,253 61
Total of Boston Elevated and West End property,			$87,117,843 64

Leased Lines.

Somerville Horse Railroad capital stock,		$153,000 00	
Newtonville & Watertown Street Railway Company,		68,146 00	
Bay State Street Railway Company, Old Colony Division, West Roxbury (value as leased, on which 6½ per cent. rental),	$334,554 87		
Add payment by Old Colony for improvements to December, 1911, rental at 4 per cent.,	410,228 80		
Carried forward	$744,783 67	$221,146 00	$87,117,843 64

Brought forward		$744,783 67	$221,146 00	$87,117,843 64
Less credit by unsettled bills:—				
June 30, 1912,	$1,194 79			
December 31, 1912,	17 33			
	$1,212 12			
Debit June 30, 1913,	915 28			
		296 84		
			744,486 83	
Boston & Northern Division, East Boston,			18,081 95	
Total leased lines, Bay State Street Railway Company property,				983,714 78
Total railway investment,				$88,101,558 42

City Investment as reported by the Boston Transit Commission to June 30, 1912.

Tremont Street Subway:—			
Actual cost to city,	$4,368,000		
Amount on which we pay rental at 4⅞ per cent. (difference due to value of certain real estate),		$4,343,629 65	
East Boston Tunnel rent at ⅞ of 1 per cent. of gross earnings,		3,285,319 54	
Washington Street Tunnel:—			
Amount on which we pay rental at 4½ per cent.,		7,870,656 48	
To June 21, 1913,	$8,470,656 48		
Less allowance for real estate,	600,000 00		
Beacon Hill Tunnel:—			
Amount on which we pay rental at 4⅞ per cent.,		1,418,423 50	
Total city investment,			16,918,029 17
Total investment for road leased and owned June 30, 1913,			$105,019,587 59

APPENDIX 13.

INVESTMENT, INCOME AND OUTGO, BOSTON ELEVATED RAILWAY COMPANY, 1897-1913.

YEAR.	Investment.	Total Earnings.	Operating Expenses.	Charges.	Dividends.	Surplus.
1897, . .	$25,291,913	$8,719,032	$6,213,709	$880,375	$1,193,375	$431,573
1898, . .	31,251,812	9,257,253	6,566,584	2,364,092	112,500	214,077
1899, . .	32,996,355	9,756,136	6,827,150	2,615,388	262,500	51,098
1900, . .	37,591,603	10,236,995	6,828,110	2,932,839	337,500	138,545
1901, . .	43,843,721	10,869,496	7,336,597	2,896,360	575,000	61,539
1902, . .	46,223,614	11,321,030	7,862,571	2,836,560	600,000	21,899
1903, . .	48,155,372	12,019,371	8,259,860	2,932,556	798,000	28,955
1904, . .	51,643,855	12,436,594	8,631,553	2,975,268	798,000	31,773
1905, . .	56,945,136	12,741,569	8,617,653	3,288,831	798,000	37,085
1906. . .	59,631,237	13,634,613	9,306,951	3,475,883	798,000	53,779
1907, . .	65,737,222	14,011,168	9,647,145	3,532,744	798,000	33,279
1908, . .	70,715,043	14,074,697	9,454,386	3,780,247	798,000	42,064
1909, . .	81,349,961	14,493,853	9,488,484	4,163,952	802,503	38,914
1910,[1] . .	87,754,748	11,519,685	7,321,397	3,589,342	598,500	10,446
1911, . .	92,929,314	15,980,708	10,119,064	4,511,183	1,197,000	153,461
1912, . .	101,864,059	16,522,542	10,976,634	4,840,539	1,197,000	491,631[2]
1913, . .	105.019,588	16,968,328	11,135,581	5,132,124	1,197,000	496,377[2]

[1] 1910 includes only nine months, the period of the financial year being changed.
[2] Deficit.

1897, operation by West End Street Railway Company; 1898 and thereafter, operation by Boston Elevated Railway Company.

APPENDIX 14.

STATISTICS OF OPERATION OF THE BAY STATE STREET RAILWAY SYSTEM.

	Years ending September 30.				Years ending June 30.		
	1907.	1908.	1909.	1910.[1]	1911.	1912.	1913.
Miles of single track operated,	905.69	907.58	926.22	932.04	938.78	941.79	944.41
Capital invested, including leased lines, etc.,	$40,504,400	$40,671,900	$41,789,600	$43,256,000	$44,736,900	$45,195,900	$47,821,800
Gross earnings,	$7,536,969	$7,598,162	$7,867,259	$5,666,641	$8,705,221	$9,059,844	$9,400,647
Ratio of capital to gross earnings,	5.37	5.35	5.31	7.63	5.14	4.99	5.09
Revenue passengers,	148,554,127	149,649,383	154,346,431	111,569,285	169,918,986	176,320,023	181,280,048
Revenue passengers carried per dollar of investment,	3.67	3.68	3.70	2.58	3.80	3.90	3.79
Revenue at 5 cent fare per dollar invested (cents),	18.33	18.39	18.48	12.90	18.98	19.50	18.95
Car miles run,	27,918,756	27,311,467	27,701,059	20,569,873	28,979,128	29,710,964	30,328,597
Earnings per car mile, all kinds of cars (cents),	26.99	27.82	28.41	27.55	30.04	30.49	31.00
Free transfer passengers,	18,209,692	18,908,373	20,383,155	13,431,951	21,450,389	22,085,132	22,917,709
Transfer passengers per cent. of revenue passengers,	12.26	12.64	13.21	12.04	12.62	12.53	12.65
Average fare per revenue passenger carried (cents),	4.89	4.89	4.88	4.85	4.88	4.88	4.88
Average fare per total passenger carried (cents),	4.36	4.34	4.31	4.33	4.34	4.34	4.33
Operating expenses,	$4,753,904	$4,786,798	$4,952,938	$3,784,975	$5,427,854	$5,750,052	$6,047,907
Maintenance,	970,154	1,022,275	1,159,199	921,073	1,384,696	1,509,393	1,633,432
Taxes,	423,471	442,826	470,819	360,013	524,984	514,937	609,027
Dividends,	860,648	860,648	980,339	485,116	1,148,965	1,077,681	1,253,762
Interest on bonds and other debts,	1,062,813	1,114,864	1,051,099	790,198	1,072,131	1,096,727	1,057,652
Rentals of subways, tracks, depreciations, etc.,	264,585	255,523	287,708	189,524	225,945	228,665	248,223
Surplus,	171,548	137,503	124,356	56,815	305,342	391,782	184,076

---

[1] Nine months.

APPENDIX 15.

CAPITAL EXPENDITURES FOR THE YEARS 1899–1913, INCLUSIVE, BAY STATE STREET RAILWAY COMPANY AND ITS CONSTITUENT COMPANIES.

	RAILWAY.		EQUIPMENT.		LAND AND BUILDINGS.		Other Property.	Total Additions and Improvements.	Property Sold, Burned, Abandoned or Depreciated.	Net Additions.
	New Construction.	Betterments.	New Construction.	Betterments.	New Construction.	Betterments.				
1899,	$680,278	–	$268,910	–	$136,633	–	$30,089	$1,115,910	$55,069	$1,060,841
1900,	456,121	–	322,710	–	128,532	–	44,520	951,883	83,829	868,054
1901,	733,009	–	307,188	–	179,670	–	4,906	1,224,773	53,268	1,171,505
1902,	1,063,494	–	702,171	–	475,288	–	34,025	2,274,978	15,474	2,259,504
1903,	702,695	–	926,256	–	716,572	–	1,797	2,347,320	226,122	2,121,198
1904,	463,700	$432,860	143,158	$242,980	854,579	–	–	2,137,277	69,107	2,068,170
1905,	739,201	380,719	171,778	5,480	826,748	–	–	2,123,926	108,869	2,015,057
1906,	384,789	155,956	381,369	–	235,329	–	5,424	1,162,867	83,645	1,079,222
1907,	198,075	155,940	709,802	14,869	409,266	–	333	1,488,285	173,256	1,315,029
1908,	93,557	110,888	53,814	–	285,561	–	–	543,820	31,124	512,696
1909,	308,721	311,403	16,929	–	65,623	–	–	702,676	–	702,676
1910, 9 months,	200,996	–	373,877	–	184,083	–	–	758,956	81,090	677,866
1911,	226,686	277,437	114,127	–	263,962	–	–	882,212	23,983	858,229
1912,	169,623	–	134,629	–	509,451	–	8,640	822,343	7,459	814,884
1913,	192,615	591,554	197,688	–	144,005	$18,401	12,192	1,156,455	29,238	1,127,217
	$6,613,560	$2,416,757	$4,824,406	$263,529	$5,415,302	$18,401	$141,926	$19,693,681	$1,041,533	$18,652,148

APPENDIX 16.

Maximum Length of a Profitable Ride.

It is very important and interesting, but extremely difficult, to determine how far a street railway can profitably carry passengers for a single 5 cent fare. The question does not admit of any general answer. It is impossible to ascertain accurately the cost of carrying a passenger for a given distance, for the reason that it is practically impossible to determine the average length of ride. The cars on any given line pick up and drop passengers at many points,— some passengers riding long distances and others riding very short distances. If the average length of ride could be ascertained, then from the total number of passengers the total number of passengers miles could be computed. From this figure and the total operating expense the cost per passenger mile could be found, and thus the maximum distance which a passenger could profitably be carried for a single fare could be ascertained. In the absence of the necessary data, however, the question has generally been considered to be one of ascertaining whether the company is earning more than a reasonable return or not. If it is, it may be good policy to recommend or urge that the facilities and accommodations afforded the public should be increased.

It is possible, however, by considering the subject in an approximate way, to arrive at some interesting results, and this will now be attempted for the Boston Elevated Railway Company. Its capital is as follows:—

Capital stock,	$23,879,400 00
Funded debt,	22,300,000 00
Notes,	2,050,000 00
	$48,229,400 00

This sum is about the same as the assets which represent the property, namely:—

Railway,	$30,885,608 59
Equipment,	3,004,862 33
Land, buildings, etc.,	12,566,734 06
Materials and supplies,	1,282,726 90
Other property,	188,385 05
Bonds, deposit with Commonwealth,	500,000 00
	$48,428,316 93

If we allow 5 per cent. as a fair return upon the capital stock and notes outstanding, and if we take the actual bond interest paid, we find that the total return upon the capital is $2,496,784, or an average rate of 5.18 per cent.

If the capital representing the physical property and buildings of the leased company (the West End Street Railway Company) is also included in this computation, the results would be as follows:—

		Rate Per Cent.	Return.
Boston Elevated Railway Company capital,	$48,229,400	5.18	$2,496,784 00
West End Street Railway Company preferred stock,	6,400,000	8.00	512,000 00
West End Street Railway Company common stock,	12,730,150	7.00	891,110 50
West End Street Railway Company funded debt,	18,871,000	[1]	732,360 00
Somerville Horse Railway,	153,000	6.00	9,180 00
	$86,383,550[2]	5.40	$4,661,434 50

---

[1] Varies.

[2] This total for capital does not agree with that given in Appendix 11 because it does not include the Boston subways and a few other items.

This table shows that upon the total investment of the two companies the average rate of return is about 5.4 per cent. In view of the fact that the capital of these companies has been issued under the approval of the Board of Railroad Commissioners, that the same Board approved the rate of return on the West End common and preferred stock, and has fixed the price at which the Boston Elevated Railway stock should be sold as high as $155 a share (par value $100), it cannot be urged with reason that this average rate of return is too high. If we now allow as small a sum as 1.6 per cent. per annum for depreciation charges, the company should earn a total of 7 per cent. on its capital; if the depreciation charges are allowed at 2.6 per cent., the requisite return would be 8 per cent.

Confining ourselves now to the Boston Elevated Railway Company's investment alone, since it is the operating company, we have the following data: —

Operating expenses, 1912–13,	$11,135,581 18
Taxes, 1912–13,	1,128,021 51
Interest on West End Street Railway funded debt,	776,360 00
Interest on West End common and preferred stocks and other charges on leased property,	1,468,819 15
Subway rentals,	687,308 54
Total charges, except return on Boston Elevated Railway Company investment,	$15,196,090 38

Total number of revenue passengers,	326,352,863
Total number of passengers riding on each line, including revenue passengers and those who transfer from the line on which they pay fare to another line, either by transfer check or by transfer where no check is required (taking transfer passengers as about six-tenths of revenue passengers), estimated at,	524,666,992
Total car miles run,	57,504,571
Total number of half-round trips,	13,443,554
Average length of a half-round trip (miles),	4.28

If now we assume that every passenger rides the entire length of a half-round trip, the total number of passenger miles is

$$524,666,992 \times 4.28 = 2,245,574,726$$

But each passenger (including transfers) does not ride the entire length of a half-round trip; if we assume that he rides two-thirds of this distance, the real number of passenger miles is

$$\tfrac{2}{3} \cdot 2,245,574,726 = 1,497,049,817$$

and the actual cost per passenger mile, exclusive of return on investment and depreciation and sinking fund charges, is

$$\frac{\$15,196,090}{1,497,049,817} = 1.01 \text{ cents.}$$

If, then, the actual cost of carrying a passenger a mile, not allowing for return on investment, is 1.01 cents, it follows that if a passenger is carried

$$\frac{5}{1.01} = 4.95 \text{ miles}$$

his fare is entirely used for expenses, leaving no return on capital; in other words, a portion of each 5 cent fare must be reserved for return on capital, leaving only the remainder available for operating expenses and taxes.

Last year the capital of the Boston Elevated Railway Company received a total return of, . . .	$2,496,784
Other charges, ...	15,196,090
Total, ...	$17,692,874

In other words, every 5 cent fare received was divided as follows:—
Return on capital

$$5 \cdot \frac{2,496,784}{17,692,874} = 0.7 \text{ cent.}$$

Available for expenses and taxes

$$5 \cdot \frac{15,196,090}{17,692,872} = 4.3 \text{ cents.}$$

The maximum distance, therefore, which the company could afford to carry a passenger for 5 cents, giving capital the return received last year, is

$$\frac{4.3}{1.01} = 4.25 \text{ miles.}$$

If the total return on capital and for depreciation had been 7 per cent. we should have:—

Return on capital and depreciation, 7 per cent. on $48,229,400	$3,376,058
Expenses as above, ...	15,196,090
Total, ...	$18,572,148

In this case, the proportion of a 5 cent fare available for expenses would be represented by the fraction $\frac{15,196,090}{18,572,148}$ and we shall have:—

Return on capital,

$$5 \cdot \frac{3,376,058}{18,572,048} = 0.93 \text{ cent.}$$

Available for expenses and taxes,

$$5 \cdot \frac{15,196,090}{18,572,148} = 4.07 \text{ cents.}$$

Maximum length of profitable ride for 5 cents equals

$$\frac{4.07}{1.01} = 4.03 \text{ miles.}$$

Again, if we assume that 8 per cent. is a fair allowance for capital return and depreciation, we have:—

Return on capital and depreciation, 8 per cent. on $48,229,400, ...	$3,858,352
Expenses as above, ...	15,196,090
Total, ...	$19,054,442

Return on capital,

$$5 \cdot \frac{3,858,352}{19,054,442} = 1.01 \text{ cents.}$$

Available for expenses and taxes,

$$5 \cdot \frac{15,196,090}{19,054,442} = 3.99 \text{ cents.}$$

Maximum length of profitable ride for 5 cents,

$$\frac{3.99}{1.01} = 3.95 \text{ miles.}$$

These results are very illuminating. The only assumptions involved are the estimate of transfer passengers, and that every passenger rides two-thirds the entire length of a half-round trip.

Regarding the first estimate, it seems liberal to assume that six-tenths of all the passengers who pay fares transfer to some other line. If the number is less than this, the actual number of passenger miles operated is less than has been computed, and consequently the actual cost per passenger mile is greater than computed, from which it follows that the profitable ride would be less than 4.25 miles on the basis of present return on capital.

Regarding the assumption that every passenger, including transfer passengers, rides two-thirds the length of a half-round trip, it seems probable that this, too, is a large estimate, and that a lower one would be more nearly correct. If this is true, it would also indicate that the profitable haul is less than 4.25 miles. Furthermore, the expense of operation is nearly constant, whether passengers ride the entire length of a half-round trip or only a fraction of that length, for wages and all other expenses, except that for the additional power necessary to haul the weight of the passengers, are the same whether he travels the entire route or only a part of it.

From the above investigation it therefore appears that the limit of a profitable haul, without allowing any greater return on the investment, and for depreciation, than at present, is probably less than four and a quarter miles. Any passenger who rides a greater distance than this is getting more than he pays for, and any one who rides less than this is getting less than he pays for. This statement is as close an approximation to the truth as can be deduced from the available statistics.

APPENDIX 17.

BOSTON ELEVATED RAILWAY COMPANY SYSTEM — REVENUE PASSENGERS PER HALF-ROUND TRIP.

COMPANY.	Year.	Revenue Passengers per Half-round Trip.	Miles of Single Track operated.
West End,	1888	22.80	231
West End,	1889	23.63	253
West End,	1890	24.49	257
West End,	1891	25.61	260
West End,	1892	27.92	263
West End,	1893	29.06	268
West End,	1894	29.54	273
West End,	1895	30.82	275
West End,	1896	29.56	296
West End,	1897	29.20	304
Boston Elevated,	1898	28.86	316
Boston Elevated,	1899	30.20	338
Boston Elevated,	1900	29.66	370

BOSTON ELEVATED RAILWAY COMPANY SYSTEM — REVENUE PASSENGERS PER HALF-ROUND TRIP.— *Concluded.*

COMPANY.	Year.	Revenue Passengers per Half-round Trip.	Miles of Single Track operated.
Boston Elevated, ...	1901	27.51	408 [1]
Boston Elevated, ...	1902	23.82	409
Boston Elevated, ...	1903	23.22	437 [2]
Boston Elevated, ...	1904	23.43	445
Boston Elevated, ...	1905	23.75	448
Boston Elevated, ...	1906	24.03	457
Boston Elevated, ...	1907	24.26	462
Boston Elevated, ...	1908	24.60	474
Boston Elevated, ...	1909	25.41	484
Boston Elevated, ...	1910	25.69	485
Boston Elevated, ...	1911	25.55	488
Boston Elevated, ...	1912	25.63	507
Boston Elevated, ...	1913	24.275	511

[1] Elevated line opened June 10.

[2] West Roxbury lines leased.

APPENDIX 18.

BAY STATE STREET RAILWAY COMPANY.— COMPARISON OF STEAM ROAD AND STREET RAILWAY FARES WITHIN THE BOSTON AND SUBURBS DISTRICT.

Miles.	STATIONS.	Railroad Fares.	Street Railway Fares (Cents).
3	Boston–East Somerville, .	12 rides at 60 cents (5 cents each), .	5
4	Boston–Wellington, . .	12 rides at 75 cents (6¼ cents each), .	5
4	Boston–Edgworth, . .	12 rides at 85 cents (7½ cents each), .	5
5	Boston–Malden . . .	12 rides at 90 cents (7½ cents each), .	5
6	Boston–Oak Grove, . .	12 rides at 90 cents (7½ cents each), .	5
6	Boston–Fells, ...	12 rides at 95 cents ($7\frac{11}{12}$ cents each), .	5
5	Boston–Glenwood, . .	12 rides at 85 cents ($7\frac{1}{12}$ cents each),	5
5	Boston–Park Street, . .	12 rides at 85 cents ($7\frac{1}{12}$ cents each), .	5
6	Boston–Medford, . . .	12 rides at 90 cents (7½ cents each), .	5
4	Boston–Everett, . . .	12 rides at 60 cents (5 cents each), .	5

BAY STATE STREET RAILWAY COMPANY.— COMPARISON OF STEAM ROAD AND STREET RAILWAY FARES WITHIN THE BOSTON AND SUBURBS DISTRICT.— *Continued.*

Miles.	STATIONS.	Railroad Fares.	Street Railway Fares (Cents).
4	Boston–East Everett,	12 rides at 60 cents (5 cents each),	5
5	Boston–Chelsea	12 rides at 85 cents ($7\frac{1}{12}$ cents each),	5
6	Boston–Forbes,	12 rides at 95 cents ($7\frac{11}{12}$ cents each),	5
7	Boston–Revere,	12 rides at 95 cents ($7\frac{11}{12}$ cents each),	5
11	Boston–West Lynn,	12 rides at $1.35 ($11\frac{1}{4}$ cents each),	10
4	Boston–West Street	12 rides at 60 cents (5 cents each),	5
4	Boston–West Everett,	12 rides at 60 cents (5 cents each),	5
5	Boston–Bell Rock,	12 rides at 85 cents ($7\frac{1}{12}$ cents each),	5
6	Boston–Faulkner,	12 rides at 95 cents ($7\frac{11}{12}$ cents each),	5
6	Boston–Maplewood,	12 rides at 95 cents ($7\frac{11}{12}$ cents each),	5
7	Boston–Broadway,	12 rides at 95 cents ($7\frac{11}{12}$ cents each),	5
8	Boston–Linden,	12 rides at $1.05 ($8\frac{3}{4}$ cents each),	5
8	Boston–Franklin Park,	12 rides at $1.10 ($9\frac{1}{6}$ cents each),	5
9	Boston–Cliftondale,	12 rides at $1.15 ($9\frac{7}{12}$ cents each),	10
3	Boston–East Cambridge,	12 rides at 60 cents (5 cents each),	5
3	Boston–Prospect Hill,	12 rides at 60 cents (5 cents each),	5
3	Boston–Winter Hill,	12 rides at 60 cents (5 cents each),	5
3	Boston–Somerville Junction,	12 rides at 60 cents (5 cents each),	5
4	Boston–North Somerville,	12 rides at 80 cents ($6\frac{2}{3}$ cents each),	5
5	Boston–Tufts College,	12 rides at 85 cents ($7\frac{1}{12}$ cents each),	5
5	Boston–Medford Hillside,	12 rides at 85 cents ($7\frac{1}{12}$ cents each),	5
6	Boston–West Medford,	12 rides at 95 cents ($7\frac{11}{12}$ cents each),	5
8	Boston–Wedgmere,	12 rides at $1.10 ($9\frac{1}{6}$ cents each),	10
8	Boston–Winchester,	12 rides at $1.10 ($9\frac{1}{6}$ cents each),	10
6	Boston–Atlantic,	12 rides at 95 cents ($7\frac{11}{12}$ cents each),	10
6	Boston–Norfolk Downs,	12 rides at 95 cents ($7\frac{11}{12}$ cents each),	10
7	Boston–Wollaston,	12 rides at $1.00 ($8\frac{1}{3}$ cents each),	10
8	Boston–Quincy,	12 rides at $1.10 ($9\frac{1}{6}$ cents each),	10
9	Boston–Quincy Adams,	12 rides at $1.15 ($9\frac{7}{12}$ cents each),	10
6	Boston–Montclair,	12 rides at 95 cents ($7\frac{11}{12}$ cents each),	10
8	Boston–East Milton,	12 rides at $1.10 ($9\frac{1}{6}$ cents each),	10
9	Boston–West Quincy,	12 rides at $1.15 ($9\frac{7}{12}$ cents each),	10
6	Boston–Cedar Grove,	12 rides at 95 cents ($7\frac{11}{12}$ cents each),	5
7	Boston–Milton,	12 rides at 95 cents ($7\frac{11}{12}$ cents each),	5
7	Boston–Central Avenue,	12 rides at $1.00 ($8\frac{1}{3}$ cents each),	10

BAY STATE STREET RAILWAY COMPANY.— COMPARISON OF STEAM ROAD AND STREET RAILWAY FARES WITHIN THE BOSTON AND SUBURBS DISTRICT.— *Concluded.*

Miles.	STATIONS.	Railroad Fares.	Street Railway Fares (Cents).
8	Boston–Mattapan,	12 rides at $1.10 (9⅙ cents each),	5
6	Boston–Forest Hills,	12 rides at 90 cents (7½ cents each),	5
7	Boston–Mount Hope,	12 rides at 95 cents (7 11/12 cents each),	5
8	Boston–Clarendon Hills,	12 rides at $1.10 (9⅙ cents each),	10
8	Boston–Haselwood,	12 rides at $1.10 (9⅙ cents each),	10
9	Boston–Hyde Park,	12 rides at $1.15 (9 7/12 cents each),	10
10	Boston–Readville,	12 rides at $1.30 (10⅚ cents each),	10
11	Boston–East Dedham,	12 rides at $1.35 (11¼ cents each),	10
12	Boston–Stone Haven,	12 rides at $1.35 (11¼ cents each),	10
7	Boston–Roslindale,	12 rides at 95 cents (7 11/12 cents each),	5
8	Boston–Bellevue,	12 rides at $1.05 (8¾ cents each),	5
8	Boston–Highland,	12 rides at $1.10 (9⅙ cents each),	5
9	Boston–West Roxbury,	12 rides at $1.15 (9 7/12 cents each),	5
9	Boston–Spring Street,	12 rides at $1.15 (9 7/12 cents each),	5
11	Boston–Dedham,	12 rides at $1.35 (11¼ cents each),	10
6	Boston–Morton Street,	12 rides at 90 cents (7½ cents each),	5
6	Boston–Blue Hill Avenue,	12 rides at 95 cents (7 11/12 cents each),	5
7	Boston–Rugby,	12 rides at 95 cents (7 11/12 cents each),	5
8	Boston–Fairmount,	12 rides at $1.10 (9⅙ cents each),	10
9	Boston–Glenwood,	12 rides at $1.15 (9 7/12 cents each),	10
10	Boston–Readville,	12 rides at $1.30 (10⅚ cents each),	10
10	Boston–Ashcroft,	12 rides at $1.30 (10⅚ cents each),	10
11	Boston–Endicott,	12 rides at $1.35 (11¼ cents each),	10

South Boston, Crescent Avenue, Savin Hill, Harrison Square, Pope's Hill, Neponset' Field's Corner, Shawmut, Ashmont, Dorchester, Harvard Street, Mt. Bowdoin, Bird Street, Dudley Street, Back Bay, Roxbury, Heath Street, Boylston Street, Jamaica Plain, 5 rides at 25 cents equals 5 cent fare.

NOTE.— 25-ride tickets and 60-ride tickets are also on sale between Boston and all points, and in some cases this makes the rate per trip ½ cent to 1 cent less.

APPENDIX 19.

BAY STATE STREET RAILWAY COMPANY.— NAMES OF COMPANIES CONSOLIDATED AND LEASED.

Consolidated.

Lynn & Boston Railroad Company, renamed Boston & Northern Street Railway Company.
Salem & South Danvers Railroad Company.
Salem Street Railway Company.

Lowell Horse Railroad Company, renamed Lowell & Suburban Street Railway Company.
Merrimack Valley Street Railway Company.
North Woburn Street Railroad Company.
Taunton Street Railway Company.
Lynn City Street Railway Company.
Naumkeag Street Railway Company.
Haverhill & Groveland Street Railway Company.
Globe Street Railway Company.
Brockton Street Railway Company, renamed Old Colony Street Railway Company.
Gloucester Street Railway Company.
Salem & Danvers Street Railway Company.
Lowell & Dracut Street Railway Company.
Hull Street Railway Company.
East Side Street Railway Company.
Quincy Street Railway Company.
Quincy & Boston Street Railway Company.
Lynn Belt Line Street Railway Company.
Beverly & Danvers Street Railway Company.
Essex Electric Street Railway Company.
Manet Street Railway Company.
Whitman Street Railway Company.
Lowell, Lawrence & Haverhill Street Railway Company.
Peoples Street Railway Company.
Wakefield & Stoneham Street Railway Company.
Rockland & Abington Street Railway Company.
Brockton & Holbrook Street Railway Company.
Gloucester, Essex & Beverly Street Railway Company.
Rockport Street Railway Company.
Haverhill, Georgetown & Danvers Street Railway Company.
Norfolk Suburban Street Railway Company.
Braintree Street Railway Company.
Brockton & Stoughton Street Railway Company.
Hanover Street Railway Company, renamed South Shore & Boston Street Railway Company.
Braintree & Weymouth Street Railway Company.
Gloucester & Rockport Street Railway Company.
Hingham Street Railway Company.
Nantasket Electric Street Railway Company.
Dighton, Somerset & Swansea Street Railway Company.
Fall River Street Railway Company.
Reading & Lowell Street Railway Company.
West Roxbury & Roslindale Street Railway Company.
Mystic Valley Street Railway Company.
Norfolk Central Street Railway Company.
Woburn & Reading Street Railway Company.
Randolph Street Railway Company.
Taunton & Brockton Street Railway Company.
Brockton, Bridgewater & Taunton Street Railway Company.
Arlington & Winchester Street Railway Company.
Brockton & East Bridgewater Street Railway Company.
Bridgewater, Whitman & Rockland Street Railway Company.
Salem & Wakefield Street Railway Company.
Providence & Taunton Street Railway Company.
Boston, Milton & Brockton Street Railway Company.
Needham & Boston Street Railway Company.
New Bedford, Middleborough & Brockton Street Railway Company.
Georgetown, Rowley & Ipswich Street Railway Company.
Lawrence & Reading Street Railway Company.
Middleton & Danvers Street Railway Company.
Reading, Wakefield & Lynnfield Street Railway Company.
Lowell & Boston Street Railway Company.

Lowell & Woburn Street Railway Company.
Haverhill & Andover Street Railway Company.
Newport Street Railway Company (consolidated with Newport & Fall River Street Railway Company).

Leased.

Boston & Chelsea Railroad Company.
Winnisimmet Railroad Company.
East Middlesex Street Railway Company.
Boston & Revere Electric Street Railway Company.
Nashua Street Railway.
Newport & Fall River Street Railway Company.

Total companies consolidated,	66
Total companies leased,	6
Total companies,	72

APPENDIX 20.

BAY STATE STREET RAILWAY COMPANY.—MILEAGE IN THE SEVERAL CITIES AND TOWNS REFERRED TO IN HEARINGS.

	Miles of Track Owned and Leased.	
North of Boston: —		
Boston (North),	2.374	
Chelsea,	10.476	
Everett,	1.778	
Revere,	19.860	
Malden,	7.189	
		41.677
South of Boston:[1] —		
Boston (South),	1.641	
Hyde Park,	7.017	
Dedham,	7.152	
Westwood,	1.273	
Norwood,	3.753	
Walpole,	.438	
Needham,	2.577	
		23.851
Total,		65.528

APPENDIX 21.

HISTORY OF THE INCEPTION OF THE EIGHT CENT CHECK, AND ITS USE AT THE PRESENT TIME.

By chapter 113 of the Public Statutes of Massachusetts, it was enacted that a passenger riding in a street railway car from a point in the city of Boston to another point therein, upon paying a sum in addition to the established fare for such passage, and on the whole not more than 8 cents, should receive a check which would entitle him to a passage on the same day only, in any car run by any other company between any two points in said city, but not to a passage on the same route on which the check was issued, or a route parallel thereto and between and including two common points. . . . A passenger riding in a street railway car from a point within or without said city to another point therein, if the established fare between such points is not more than 6 cents, upon paying a sum in addition to such fare, and on the whole not more than 9 cents, should receive a check which would entitle him to a passage on the same day only in any car run by any other company between any points in said city, or from any point therein to any point without said city between which the established fare is not more than 6 cents, but not to a passage on the same route on which the check was issued, or a route parallel thereto, and between and including two common points.

---

[1] Exclusive of that leased to Boston Elevated under West Roxbury lease.

The use of the commutation check, proceeds of which are divided equally between the two companies, by the original act confining its use to passengers riding wholly within the city of Boston for 8 cents, or from any point within the city of Boston to points without the city of Boston for 9 cents, and in the latter case through the granting of extensions of its privileges by the Lynn & Boston Railroad Company, now the Bay State Street Railway Company, during prior years, and reduced to 8 cents, allows passengers on payment of an 8 cent fare to ride from or to any part of the Elevated system, including the elevated and tunnel lines, from or to any part of the Bay State system reached from Boston by the ordinary payment of a 5 cent fare.

Such parts of the Bay State system reached by the use of an 8 cent check comprise: —

From Scollay Square, Boston, *to* Washington Avenue, Everett Avenue, Broadway and Webster Avenue, lines in Chelsea; Broadway, Revere Beach, Beachmont, Park Avenue and Malden Street, lines in Revere; Everett Square; Sylvian Street, Melrose, via Ferry Street, and Malden Square, Maplewood Square, Malden, and Cliftondale Square, Saugus.

From Orient Heights, East Boston, *to* Revere Beach, Beachmont, and to the Revere-Chelsea line via Beach Street and Broadway, Revere.

From Chelsea Square or Bellingham Station, Chelsea, from passengers arriving by Boston Elevated tunnel cars, *to* Washington Avenue, Everett Avenue, Broadway and Webster Avenue, lines in Chelsea; Broadway, Revere Beach, Beachmont, Park Avenue and Malden Street, lines in Revere; Sylvian Street, Melrose, via Malden Square, Malden, and Cliftondale Square, Saugus.

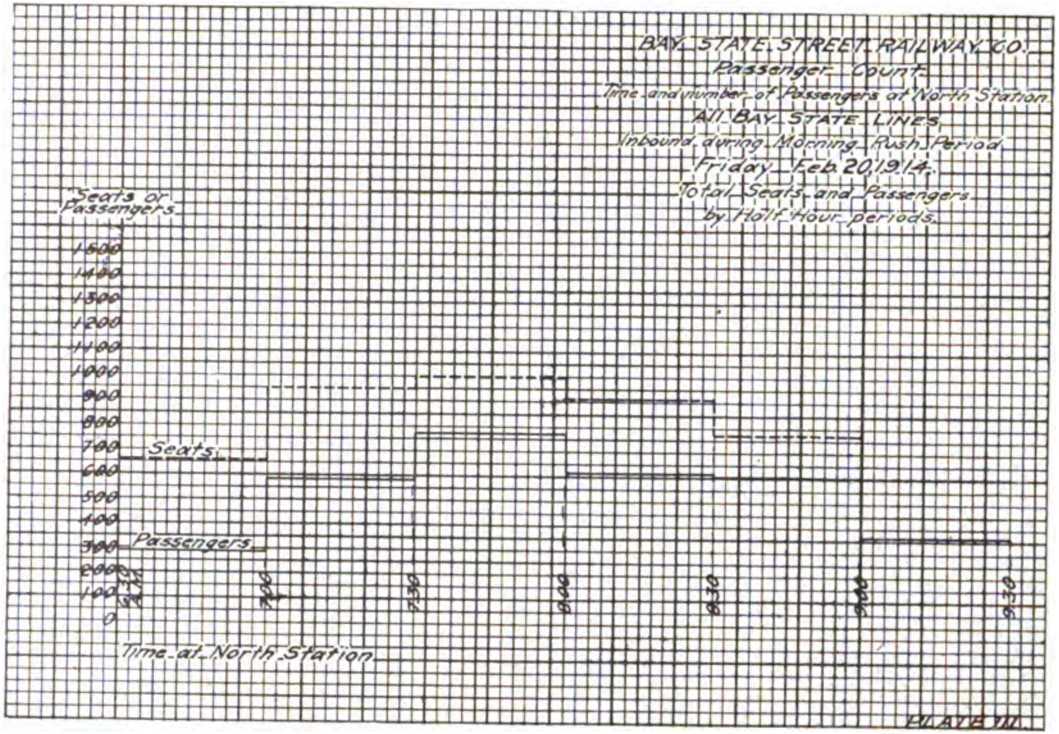

BAY STATE STREET RAILWAY CO.
Passenger Count
Time and number of Passengers at North Station
All Bay State Lines
Inbound during Morning Rush Period
Friday Feb. 20, 1914.
Total Seats and Passengers
by Half Hour periods.
Seats or Passengers
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
Seats
Passengers
6.30 A.M.
7.00
7.30
8.00
8.30
9.00
9.30
Time at North Station

PLATE VII.

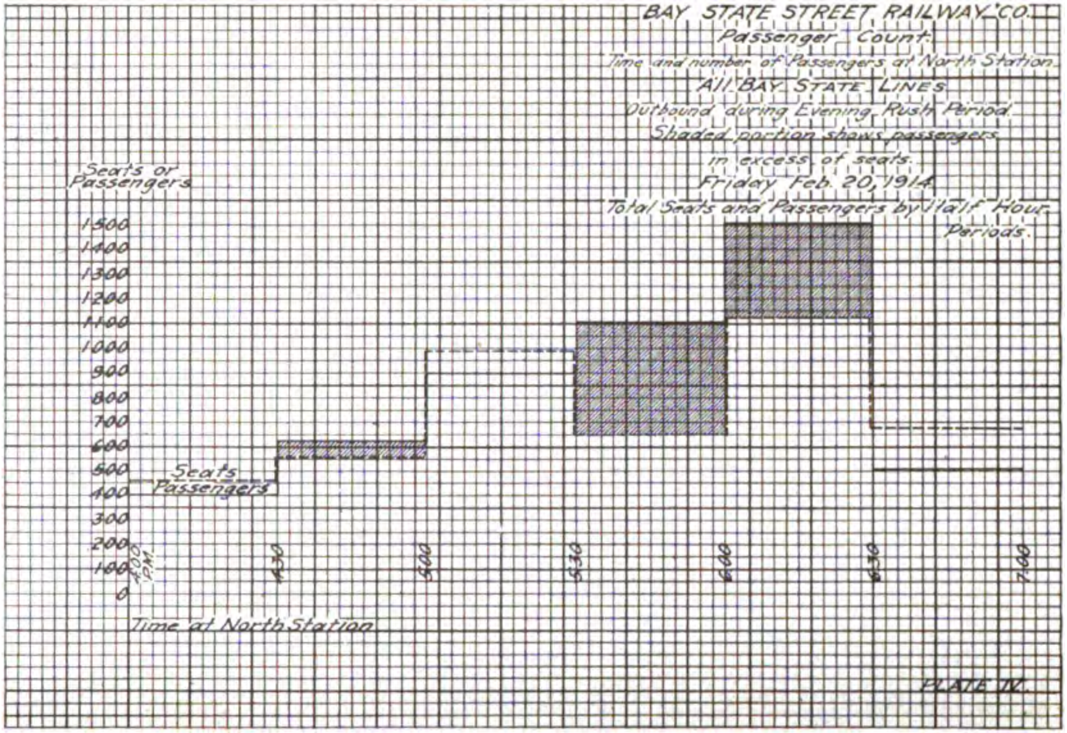

BAY STATE STREET RAILWAY CO.
Passenger Count.
Time and number of Passengers at North Station.
All BAY STATE LINES
Outbound during Evening Rush Period.
Shaded portion shows passengers
in excess of seats.
Friday Feb. 20, 1914.
Total Seats and Passengers by Half Hour Periods.
Seats or Passengers
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
Seats
Passengers
4:00 P.M.
4:30
5:00
5:30
6:00
6:30
7:00
Time at North Station

PLATE IV.

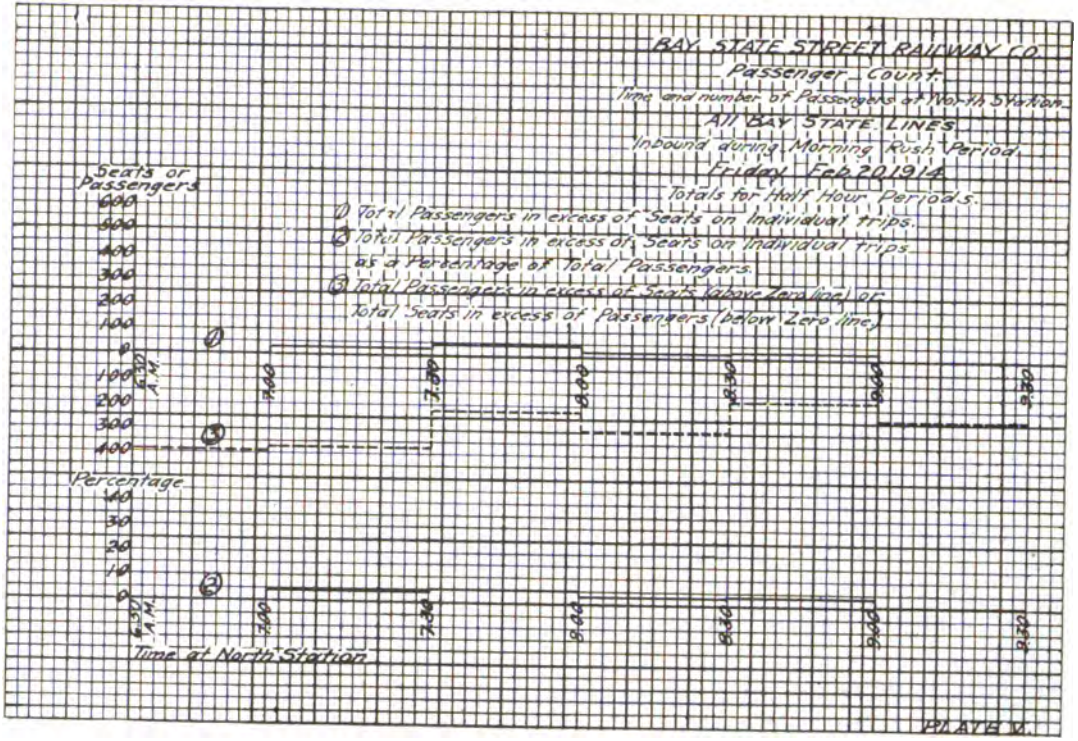
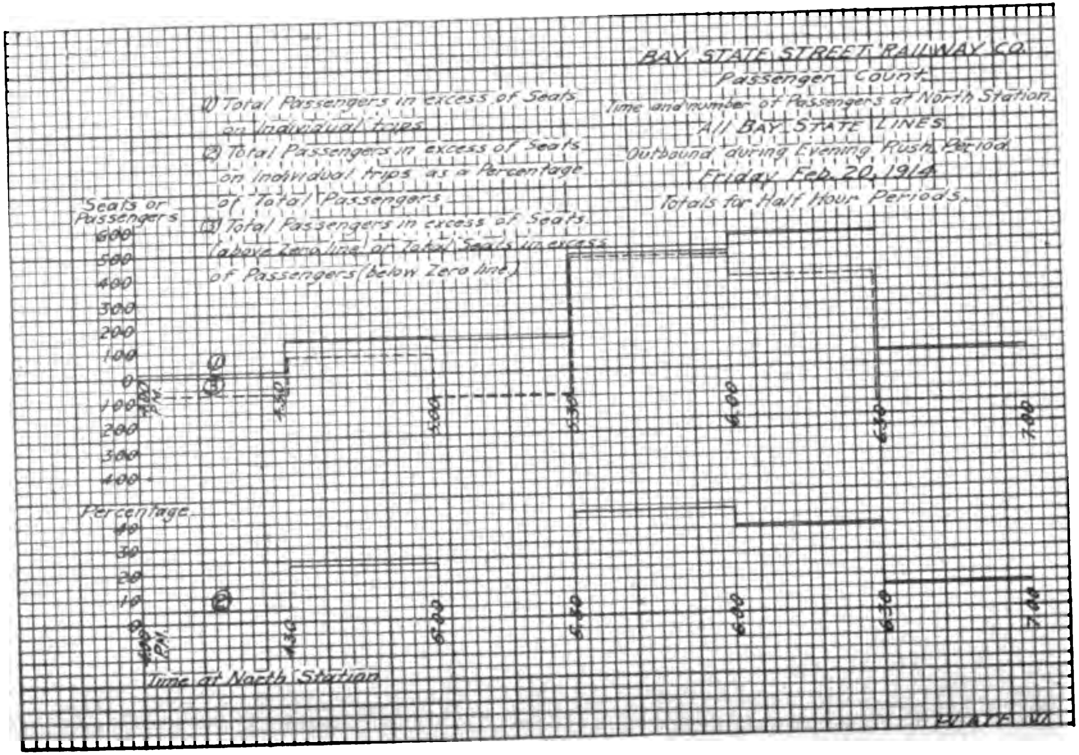

BAY STATE STREET RAILWAY CO.
Passenger Count.
Time and number of Passengers at North Station.
All BAY STATE LINES.
Inbound during Morning Rush Period.
Friday Feb 20 1914.
Totals for Half Hour Periods.
① Total Passengers in excess of Seats on Individual trips.
② Total Passengers in excess of Seats on Individual trips as a Percentage of Total Passengers.
③ Total Passengers in excess of Seats (above Zero line) or Total Seats in excess of Passengers (below Zero line)
Seats or Passengers
600
500
400
300
200
100
0
100
200
300
400
Percentage
40
30
20
10
0
①
③
②
6.30 A.M.
7.00
7.30
8.00
8.30
9.00
9.30
Time at North Station

PLATE V.


BAY STATE STREET RAILWAY CO.

Passenger Count.

Time and number of Passengers at North Station.

All BAY STATE LINES

Outbound during Evening Rush Period

Friday Feb. 20, 1914

Totals for Half Hour Periods.

PLATE XI

APPENDIX J.

REPORT TO HOUSE OF REPRESENTATIVES AS TO WORK OF COMMISSION.

THE COMMONWEALTH OF MASSACHUSETTS.

HOUSE OF REPRESENTATIVES, March 10, 1914.

ORDERED, That the Boston Transit Commission be requested to furnish the House of Representatives answers to the following questions: —

1. In the year 1913, how often did the commission meet?
2. As a general rule, how long do meetings last?
3. According to their salaries, what was the recompense per meeting that each commissioner received in 1913?
4. Are there stenographic records kept of each meeting; and, if so, by whom?
5. How many of the commission are engineers, or had any practical experience in engineering or subway construction before their appointment?
6. Who would be the most efficient at the head of the commission,— a thoroughly competent engineer, as single-headed commissioner, or the present board of five?
7. Would the efficiency of the commission be impaired if it were reduced to three members; and, if so, why?
8. How often in the last three years have plans for excavations been altered before and after work had commenced on subways, if alterations were made or allowed; and why?
9. Under the present commission what claims have been made against the city of Boston, and who was responsible for such claims?
10. What sums, if any, in excess of the amount bid on each contract for the different sections of subways have the commission allowed in the last five years?
11. Are there any non-competitive contracts given out; and, if so, on what basis, and why?
12. At whose suggestion were the entrances and exits to the Cambridge subway on Tremont street altered, and what was the cost of such alteration?

H. R., March 10, 1914.

Adopted,

FRANK E. BRIDGMAN,
Asst. Clerk, Acting Clerk.

THE COMMONWEALTH OF MASSACHUSETTS.

COMMUNICATION FROM THE BOSTON TRANSIT COMMISSION, IN RESPONSE TO AN ORDER OF THE HOUSE, SUBMITTING ANSWERS TO TWELVE SPECIFICATIONS RELATIVE TO THE PROCEDURE AND WORK OF THE COMMISSION.

BOSTON, March 17, 1914.

To the House of Representatives.

The Boston Transit Commission begs leave to submit herewith the following answers to questions asked by the House of Representatives under its order of the 10th inst.: —

Question 1. — In the year 1913, how often did the commission meet?
Answer. — One hundred and twenty-one times.

Question 2. — As a general rule, how long do meetings last?

Answer. — About three hours.

In this connection, the commission deems it proper to state that the greater part of the time devoted by the commission to its work is outside of the meetings, so that the number of meetings held and the time spent at meetings does not give an accurate idea of the work which the commission has to do. In addition to the time spent at meetings, the members of the commission have many matters referred to them individually, take many views and hold many conferences with contractors, architects, officials of the Boston Elevated Railway Company, members of the city departments, the corporation counsel, counsel for parties having legal business with the commission, and others. Claims for damages to buildings and other properties, arising from the construction of the subways, matters relating to real estate settlements, negotiations with railroad companies, and various matters of this kind are investigated by individual members of the commission outside of the regular meetings.

Question 3. — According to their salaries, what was the recompense per meeting that each commissioner received in 1913?

Answer. — Forty-one dollars and thirty cents.

Question 4. — Are there stenographic records kept of the meetings, and, if so, by whom?

Answer. — No stenographic records are kept, but regular records of all business transacted, and votes passed, are kept by the secretary.

Question 5. — How many of the commission are engineers, or had any practical experience in engineering or subway construction before their appointment?

Answer. — One.

Question 6. — Who would be the most efficient at the head of the commission — a thoroughly competent engineer, a single-headed commission, or the present board of five?

Answer. — In the opinion of the commission, a board of five would be much more efficient. (See answer to Question 7.)

Question 7. — Would the efficiency of the commission be impaired if it were reduced to three members, and, if so, why?

Answer. — In the opinion of the commission, its efficiency would be seriously impaired by a reduction to three members. The reasons for this, and also for the answer to Question 6, may be stated as follows: —

The work of the commission is of a very varied character. It involves not only technical and engineering questions connected with the actual design and construction of the subway, but also administrative and executive questions immediately concerned therewith, and a great variety of legal, real estate and business questions, often involving hundreds of thousands of dollars. In order to insure wise action, it is very desirable that all points of view should be kept in mind. Five men, having varied experience, will bring to the solution of the problems to be solved a broader outlook and will enable the interests of the city to be better taken care of than a commission of three or of one. A commission of five is not so large as to be unwieldy, nor so small that it is likely to be a one-man commission.

Experience seems to indicate that a commission of five is of the proper size for work of this kind. The New York Rapid Transit Commission, for example, had five members, and its successor, the Public Service Commission of the First District, has the same number. Moreover, the members of the present commission are experienced in the various phases of the work to be done, and the knowledge and advice of each member should be of value.

Question 8. — How often in the last three years have plans for excavations been altered before and after work had commenced on subways, if alterations were made or allowed, and why?

Answer. — The meaning of this question is not quite clear. Before work is commenced on a subway, and before the contract is let, it is frequently the case that many different plans are prepared, discussed and studied with reference to cost and availability, in order to determine the most economical and suitable design. These preliminary plans are considered not only by the commission, but many of them by the officials of the Boston Elevated Railway Company, and as a result of consultations many changes are made in them before the final plan is adopted. An illustration of this is shown in the accompanying diagram which indicates studies made for the route of the Dorchester Tunnel under Fort Point Channel. After a definite plan is adopted, contract drawings are made, bids called for, and a construction contract entered into. Since the work of the commission is mostly underground, it is impossible, by the nature of the case, notwithstanding borings which are always made, to tell beforehand just what dimensions or structures will be required. It is only after an excavation has been made that information will be available regarding the precise character of the ground, the size, number and shape of pipes and other underground obstructions, and the character of building foundations. For this reason the contract plans often have to be modified from time to time, and the specifications and plans provide for such modifications. An illustration of this is the following note, which appears in the specifications and contract plan for most, if not all, of our work: —

> The precise character of the foundations and section at any given point cannot be determined in advance, but will be decided upon by the engineer as occasion demands.

Moreover, in order to expedite the work, the contract for a certain section is often let before a final decision has been arrived at concerning certain questions, such, for instance, as the precise arrangement of the entrances to stations and other similar matters.

Specifically answering the question as to what alterations have been made in the last three years, the following are the principal changes made within that period subsequent to the letting of the contract: —

Cambridge Connection.— Section 2: A change was made in the motor room of the southerly inclined elevator on account of a change in the driving mechanism of the elevator. This change was made at the request of the Otis Elevator Company and partly at their expense.

Dorchester Tunnel.— Section A: The contract plans for Section A, Dorchester Tunnel, were dated May 23, 1912. These show the tunnel to be on a 3.8 per cent. grade for the greater part of the length of the section. On July 25, 1912, these plans were amended by changing this grade to one of 3 per cent.

At the easterly end of the section there were two slight changes made both previous to Oct. 23, 1913. Both these changes were caused by the design of the adjoining work on Section B. The first was a very slight change in alignment. When Section A was designed, an 800-foot radius curve was prepared to connect the tracks in Winter Street with those in Summer Street. In order to locate the station in Summer Street nearer Washington Street, this radius was changed to 500 feet. The second change, also a very slight one, was in the vertical curve connecting the 3 per cent. grade on Section A with the level grade on Section B. This change was made when the details of Section B were designed because it was found desirable to lower the grade so that headroom could be obtained on the platform under the sewers. The underpinning walls were changed slightly on Section A to better accommodate the property owners.

Section B: A small change in the contract plans for Section B was made to provide for an entrance and exit at Chauncy Street and an exit at Hawley Street. This was due to the fact that the definite location for the entrances was not determined when the general contract for the station was awarded.

A change was made in the plans of the stairway leading from the Winter station platform to the passageway connecting with the Dorchester Tunnel station in Summer Street. No construction work had been done on this stairway when this change was made.

When the contract plans for this stairway were made it was contemplated placing it in the property at the southwest corner of Winter and

Washington streets, which was then owned by the city, but which had been leased for a term of years. As the result of subsequent conferences with the lessee, the plans were altered and the stairway was located in the Winter station platform outside the property. Afterwards this property was sold by the city, and as the purchaser gave the city permission to build this stairway on the property, the plans were changed accordingly and the stairway built as originally contemplated.

Boylston Street Subway. — Section 1: First, the first 43 feet of the incline at Kenmore Street was widened at the request of the park and recreation department of the city to provide a more open space in which to give warning to pedestrians of approaching cars.

Second, near the Hotels Somerset and Eastgate, the excavation was widened about 6 inches on each side of the subway and two trenches 4 feet wide, 12 feet deep and 50 feet long were dug in Charlesgate East, alongside of the above hotels, in which steel sheet piling was driven. The excavation necessary for underpinning these hotels as contemplated by the original plans was omitted.

These changes were made as a result of information obtained during the progress of the work, in order to avoid interference with the foundations of the hotels, and because it was believed to be a cheaper method of protecting these hotels from injury. This has since been shown to have been the case.

Section 2: The location of the south stairway from the ticket office lobby to the platform was changed 23½ feet to the east and the station outline slightly changed in consequence.

This change was made to economize room at the basement level in the lot at the corner of Massachusetts Avenue and Newbury Street, and was made before any construction had begun at this point.

Section 3: About 180 feet of the subway was slightly widened near Exeter Street to allow for a cross-over between the tracks.

Section 4: First, additional excavation was made for the temporary location of the 42-inch high-service water pipe through Dartmouth and Newbury streets from Huntington Avenue to Clarendon Street. The change was made to avoid the danger or risk of a break in the pipe, which is a very important one in the distribution system.

Second, an additional toilet room at the north end of the lobby under Dartmouth Street was built.

Third, slight changes were made in the grade and alignment of the 3 foot 8 inch by 5 foot 10 inch sewer between Dartmouth Street and Berkeley Street, at the request of the public works department.

Fourth, the location of the emergency exit and ventilation chamber at Berkeley Street was made to keep the structures off private property, as a result of conferences with the owners.

Question 9.— Under the present commission what claims have been made against the city of Boston and who was responsible for such claims?

Answer. — Herewith is submitted a list of the suits which have been brought against the city of Boston, with a statement of the parties bringing such suits.

Suits.

Fred O. Prince *et al. v.* City of Boston.
John C. Ropes *et al. v.* City of Boston.
James H. Bowen *et al. v.* City of Boston.
Frances E. Sprague *et al. v.* City of Boston.
George R. White *v.* City of Boston.
Jones & Meehan *v.* City of Boston.
Charles U. Cotting *v.* City of Boston.
Albert H. Kelsey *v.* City of Boston.
Edwin P. Boggs *et al. v.* City of Boston.
Wm. Minot *et al. v.* City of Boston.
William O. Wiley *v.* City of Boston.
Caroline E. Gary *et al. v.* City of Boston.
Charles E. Waldo *v.* City of Boston.

Fifty Associates *v.* City of Boston.
Peter O'Riorden *v.* City of Boston.
David B. Flint *v.* City of Boston.
Michael Roughan *v.* City of Boston.
Michael Roughan *v.* City of Boston.
Michael Roughan *v.* City of Boston.
Edward Gagan *v.* City of Boston.
Fifty Associates *v.* City of Boston.
Margaret O'Connor *v.* City of Boston.
Causten Brown *et al.* *v.* City of Boston.
Charles U. Cotting *v.* City of Boston.
Rhodes Lockwood *et al.* *v.* City of Boston.
Albert H. Kelsey *v.* City of Boston.
J. Theodore Heard *et al.* *v.* City of Boston.
Wm. O. Wiley *v.* City of Boston.
Charles S. Waldo *v.* City of Boston.
Fifty Associates *v.* City of Boston.
Henry W. Van Voorhis *v.* City of Boston.
John F. Kirby *v.* City of Boston.
Israel A. Ratchesky *et al.* *v.* City of Boston.
Causten Brown *et als.* *v.* City of Boston.
National Docks & Warehouse Co. *v.* City of Boston.
Walter Baker Co. *v.* George G. Crocker *et als.*, Cavanagh *et als.*
Dominie Rosetti *v.* Boston Tunnel Con. Co., Geo. G. Crocker *et als.*, Transit Com'n, Trustees.
Joshua M. Sears *v.* George G. Crocker *et als.*
Frank E. Smith *v.* Boston Tunnel Con. Co.
Charles Carline *v.* Boston Tunnel Con. Co., Geo. G. Crocker *et als.*, Transit Com'n, Trustees.
Mary Carline *v.* Boston Tunnel Con. Co., Geo. G. Crocker *et als.*, Transit Com'n, Trustees.
Martin W. Christopher *v.* George G. Crocker *et als.*, Transit Com'n, Trustees.
Daniel H. Seybolt *v.* George G. Crocker *et als.*, Transit Com'n, Trustees.
Props. of Long Wharf *v.* City of Boston.
Moses Williams *et als.*, Trs., *v.* City of Boston.
John C. Palfrey *et als.*, Trs., *v.* City of Boston.
William P. Blake *et al.*, Trs., *v.* City of Boston.
Juliana M. Lovering *v.* City of Boston.
John C. Palfrey and John C. Palfrey, Trs., *v.* City of Boston.
National Dock & Warehouse Co. *v.* City of Boston.
James B. Case *et al.*, Trs., *v.* City of Boston.
James B. Case *et al.*, Trs., *v.* City of Boston.
James B. Case *et al.*, Trs., *v.* City of Boston.
William P. Blake *et al.*, Trus., *v.* City of Boston.
Charles E. Cotting *et al.* *v.* City of Boston.
Charles E. Cotting *et al.* *v.* City of Boston.
Philip Dexter *et al.*, Trs., *v.* City of Boston.
Willard Dalrymple *et als.*, Trs., *v.* City of Boston.
Fifty Associates *v.* City of Boston.
Fifty Associates *v.* City of Boston.
Fifty Associates *v.* City of Boston.
Oliver W. Holmes, Tr., *et al.* *v.* City of Boston.
Geo. B. Inches *et al.*, Exec's & Trs., *v.* City of Boston.
Emma Rogers *v.* City of Boston.
Francis Shaw, Jr., *et al.* *v.* City of Boston.
State Street Exchange *v.* City of Boston.
Abby S. Loring *et al.* *v.* City of Boston.
Harry L. Leonard, Lessee, *v.* City of Boston.
R. I. Sherman Mfg. Co. *v.* City of Boston.
Proprietors of Long Wharf *v.* City of Boston.
Proprietors of Long Wharf *v.* City of Boston.
Thomas A. Cromwell, Lessee, *v.* City of Boston.

Proprietors of Long Wharf *v.* City of Boston.
Moses Williams, Tr., *v.* City of Boston.
Old Colony Tr. Co., Lessee of Ames Bldg., *v.* City of Boston.
Old Colony Tr. Co., Lessee of Ames Bldg., *v.* City of Boston.
John C. Palfrey *et al.*, Trs., *v.* City of Boston.
Proprietors of Long Wharf *v.* City of Boston.
Proprietors of Long Wharf *v.* City of Boston.
Proprietors of Long Wharf *v.* City of Boston.
Proprietors of Long Wharf *v.* City of Boston.
Proprietors of Long Wharf *v.* City of Boston.
Francis C. Welch *et al.*, Tr., *v.* City of Boston.
Francis C. Welch *et al.*, Tr., *v.* City of Boston.
Francis C. Welch *et al.*, Tr., *v.* City of Boston.
Old Colony Trust Co. *v.* City of Boston.
Old Colony Tr. Co., Lessee, *v.* City of Boston.
Fifty Associates *v.* City of Boston.
Fifty Associates *v.* City of Boston.
Fifty Associates *v.* City of Boston.
State Street Exchange *v.* City of Boston.
Willard Dalrymple *et al.*, Trs., *v.* City of Boston.
William P. Blake *et al.*, Trs., *v.* City of Boston.
Charles E. Cotting *et al.*, Trs., *v.* City of Boston.
Charles E. Cotting *et al.*, Trs., *v.* City of Boston.
Emma Rogers *v.* City of Boston.
Francis Shaw, Jr., *et al.*, Trs., *v.* City of Boston.
Oliver W. Holmes, Tr., *v.* City of Boston.
Abby S. Loring *et al.* *v.* City of Boston.
Philip Dexter *et al.*, Trs., *v.* City of Boston.
George B. Inches *v.* City of Boston.
Joshua M. Sears *v.* City of Boston.
Joseph Cohen *et al.* *v.* City of Boston.
Thomas Kelley *v.* City of Boston.
Wm. K. Porter *v.* City of Boston.
Wm. J. Mixter *et al.* *v.* City of Boston.
Charles J. Lavis *et al.*, Lessees, *v.* City of Boston.
John Glickland *v.* City of Boston.
J. W. McLaughlin Co., Lessee, *v.* City of Boston.
Annie B. Matthews *et al.* *v.* City of Boston.
Grant Walker *v.* City of Boston.
Percival Lowell *et al.* *v.* City of Boston.
David H. Hayden *et al.* *v.* City of Boston.
Annie Crosson *et al.* *v.* City of Boston.
Francis W. Sargent *et al.* *v.* City of Boston.
William J. Batchelder *v.* City of Boston.
Fred C. Bowditch *et al.* *v.* City of Boston.
John C. Gray *et al.* *v.* City of Boston.
Patrick T. Sheppard *v.* City of Boston.
C. E. Osgood Co. *v.* City of Boston.
Sam'l W. Bridgham *v.* City of Boston.
Charles E. Cotting *et al.*, Trs., *v.* City of Boston.
Elsie Dexter *et al.* *v.* City of Boston.
Wm. S. Dexter *et al.*, Tr., *v.* City of Boston.
Fred S. D'Hauteville *v.* City of Boston.
Globe Newspaper Co. *v.* City of Boston.
George B. Inches *et al.* *v.* City of Boston.
George B. Inches *et al.* *v.* City of Boston.
David Sears *et al.* *v.* City of Boston.
Sarah W. Swan *et al.* *v.* City of Boston.
Harry H. Thorndike *et al.* *v.* City of Boston.
Francis C. Welch *et al.*, Tr., *v.* City of Boston.
Charles E. Cotting *et al.*, Trs., *v.* City of Boston.
Annie B. Matthews *et al.* *v.* City of Boston.
Edward F. Gilman *et al.*, Lessees, *v.* City of Boston.

Talbot Company *v.* City of Boston.
Patrick T. Sheppard *v.* City of Boston.
John C. Gray *et al.*, Trs., *v.* City of Boston.
Charles O. L. Dillaway *et al. v.* City of Boston.
Addison L. Aldrich *et al. v.* City of Boston.
William H. Hill *et al. v.* City of Boston.
John N. Landers *v.* City of Boston.
Lotta M. Crabtree *v.* City of Boston.
Fred S. D'Hauteville *v.* City of Boston.
Springfield Breweries Co. *v.* City of Boston.
Wm. Filene's Sons Co. *v.* City of Boston.
Walter N. Lowney Co. *v.* City of Boston.
Abraham Shuman *v.* City of Boston.
Charles W. Porter *et al. v.* City of Boston.
A. Shuman & Co. *v.* City of Boston.
Susan M. Stuart *v.* City of Boston.
M. A. Atkinson Co. *v.* City of Boston.
Massachusetts General Hospital *v.* City of Boston.
Anna P. Rogers *v.* City of Boston.
James A. Whitcomb *v.* City of Boston.
Susan M. Stuart *v.* City of Boston.
Charles H. Dill *v.* City of Boston.
Cushing Medical Supply Co. *v.* City of Boston.
Oscar Grosberg *v.* City of Boston.
Cushing Medical Supply Co. *v.* City of Boston.
John E. Wasserboehr & Son *v.* City of Boston.
L. R. Coy & S. A. Mayo *v.* City of Boston.
Hales W. Suter *et als. v.* City of Boston.
Mary C. Colby *et als. v.* City of Boston.
Hales W. Suter *et als. v.* City of Boston.
Francis C. Welch *et als.*, Trs., *v.* City of Boston.
Francis C. Welch *et als.*, Trs., *v.* City of Boston.
Fifty Associates *v.* City of Boston.
Fifty Associates *v.* City of Boston.
Frederick R. Sears *et als.*, Trs., *v.* City of Boston.
Charles E. Cotting *et al.*, Trs., *v.* City of Boston.
David Sears *et als. v.* City of Boston.
Samuel W. Bridgham *et als. v.* City of Boston.
Globe Newspaper Co. *v.* City of Boston.
George B. Inches *et al. v.* City of Boston.
George B. Inches *et al. v.* City of Boston.
George B. Inches *et al. v.* City of Boston.
Charles E. Cotting *et al. v.* City of Boston.
George T. Dexter *et al. v.* City of Boston.
Sarah H. Swan *v.* City of Boston.
Francis C. Welch *et al. v.* City of Boston.
Charles E. Cotting *et al. v.* City of Boston.
Frederick R. Sears *et al.*, Trs., *v.* City of Boston.
Charles E. Cotting *et al.*, Trs., *v.* City of Boston.
Frederick S. Grand D' Hautville *v.* City of Boston.
Francis C. Welch *et al.*, Trs., *v.* City of Boston.
John R. Perry *et al. v.* City of Boston.
New England Trust Co. *v.* City of Boston.
David P. Kimball *v.* City of Boston.
Robert Codman *et al. v.* City of Boston.
Frank W. Wildes *et al. v.* City of Boston.
John H. Foster *et al. v.* City of Boston.
Central Wharf Co. *v.* City of Boston.
Benjamin Blanchard *v.* City of Boston.
Arthur J. C. Sowden *v.* City of Boston.
William V. Hyde *v.* City of Boston.
William V. Hyde *v.* City of Boston.
Geo. H. Woodbury *et al. v.* City of Boston.

W. L. Douglas Shoe Co. *v.* City of Boston.
Blackstone Savings Bank *v.* City of Boston.
Blackstone Savings Bank *v.* City of Boston.
Wisdom E. Bell *et al.* *v.* City of Boston.
Alvah L. McMullin *v.* City of Boston.
Alvah L. McMullin *v.* City of Boston.
Springfield Breweries Co. *v.* City of Boston.
Puritan Cloak Clothing Co. *v.* City of Boston.
Henry Oppenheim *et al.* *v.* City of Boston.
Melmon L. Fletcher *v.* City of Boston.
Hales W. Suter *et al.* *v.* City of Boston.
Wm. T. Hight *et al.* *v.* City of Boston.
Francis Peabody, Jr., *et al.* *v.* City of Boston.
Francis Peabody, Jr., *et al.* *v.* City of Boston.
John C. Gray *et al.* *v.* City of Boston.
Charles P. Jaynes *v.* City of Boston.
Charles P. Jaynes *v.* City of Boston.
Charles P. Jaynes *v.* City of Boston.
Charles P. Jaynes *v.* City of Boston.
Francis H. Richards, Ex., *v.* City of Boston.
John Briggs *et als.* *v.* City of Boston.
Aug. L. Thorndike *et al.* *v.* City of Boston.
Robert H. Gardiner *v.* City of Boston.
Old South Association *v.* City of Boston.
Francis Peabody *et al.* *v.* City of Boston.
David P. Kimball *v.* City of Boston.
New England Trust Co. *v.* City of Boston.
F. S. Grand d'Hautville *v.* City of Boston.
Charles E. Cotting *et al.* *v.* City of Boston.
Charles E. Cotting *et al.* *v.* City of Boston.
Charles E. Cotting *et al.* *v.* City of Boston.
Harry H. Thorndike *et al.* *v.* City of Boston.
Francis C. Welch *et al.* *v.* City of Boston.
Sarah H. Swan *et al.* *v.* City of Boston.
H. M. Nelson *v.* City of Boston.
George T. Dexter *et al.* *v.* City of Boston.
Charles E. Cotting *et al.* *v.* City of Boston.
George B. Inches *et al.* *v.* City of Boston.
George B. Inches *et al.* *v.* City of Boston.
Globe Newspaper Co. *v.* City of Boston.
Sam'l W. Bridgham *et al.* *v.* City of Boston.
David Sears *et al.* *v.* City of Boston.
Charles E. Cotting *et al.* *v.* City of Boston.
Francis I. Amory *et al* *v.* City of Boston.
Francis I. Amory *et al.* *v.* City of Boston.
Fifty Associates *v.* City of Boston.
Fifty Associates *v.* City of Boston.
Francis C. Welch *v.* City of Boston.
Hales W. Suter *v.* City of Boston.
Hales W. Suter *v.* City of Boston.
Mary C. Colby *et al.* *v.* City of Boston.
Moses Williams, Jr., *et al.* *v.* City of Boston.
Stillman F. Kelley, Lessee, *v.* City of Boston.
Joseph E. Merrill *v.* City of Boston.
Wm. T. Hight *et al.* *v.* City of Boston.
E. D. Codman *et al.* *v.* City of Boston.
Benj. B. Freeman *et al.*, Lessees, *v.* City of Boston.
John C. Sawyer *v.* City of Boston.
West End Street Ry. Co. *v.* City of Boston.
Andreas Gunaris *v.* Geo. G. Crocker *et als.*
Simeon E. Baldwin *et al.*, Exs. & Trs., *v.* City of Boston.
Yale University *v.* City of Boston.
George Wendell Phillips *v.* City of Boston.

George N. Talbot *v.* City of Boston.
William V. Hyde *v.* City of Boston.
Moses Williams, Jr., *et al. v.* City of Boston.
Richard H. Dana *et al.*, Trs., *v.* City of Boston.
Robert H. Gardiner *et al.*, Trs., *v.* City of Boston.
Moses Williams, Jr., *et al.*, Trs., *v.* City of Boston.
Moses Williams, Jr., *et al.*, Trs., *v.* City of Boston.
George N. Talbot *v.* George G. Crocker *et als.*
David Goodman *v.* City of Boston.
Groigio Costantino *et al. v.* City of Boston.
Barnet Gray *v.* City of Boston.
Max Ravreby *v.* City of Boston.
Aaron Krause *v.* City of Boston.
Samuel Goldsmith *v.* City of Boston.
Elizabeth Silverman *v.* City of Boston.
Sam'l I. Adelson *v.* City of Boston.
Meyer W. Pietchel *et al. v.* City of Boston.
Frederick Nichols *v.* City of Boston.
Sam'l Segal *et al. v.* City of Boston.
Horace W. Baxter *et al. v.* City of Boston.
Morris Berkowitz *v.* City of Boston.
John Noble, Tr., *v.* City of Boston.
John Noble, Tr., *v.* City of Boston.
Rebecca Sandofsky *v.* City of Boston.
Max H. Morse *v.* City of Boston.
Max Gordon *v.* City of Boston.
Wilno Congregation *v.* City of Boston.
Isaac Gorder *v.* City of Boston.
Celia Schneider *v.* City of Boston.
Morris Edelstein *v.* City of Boston.
Annie Young *v.* City of Boston.
Fannie Brown *v.* City of Boston.
Harris Edison *v.* City of Boston.
Henry N. Sweet, Tr., *v.* City of Boston.
Henry N. Sweet, Tr., *v.* City of Boston.
Annie L. Woods *v.* City of Boston.
Ellen R. Forristall *v.* City of Boston.
E. Pierson Beebe *et al. v.* City of Boston.
Louis Cabot *v.* City of Boston.
Arthur E. Burr *v.* City of Boston.
Elizabeth G. Ford *v.* City of Boston.
Anne S. Banfield *v.* City of Boston.
Elizabeth G. Ford *v.* City of Boston.
Mary E. Aldrich *v.* City of Boston.
Mass. Soc. Preven. Cruelty to Animals *v.* City of Boston.
Joseph Lee *v.* City of Boston.
Twentieth Century Club *v.* City of Boston.
Episcopal Church Association *v.* City of Boston.
Curtis Guild *et al. v.* City of Boston.
Charles W. Allen *et al. v.* City of Boston.
Harriot Curtis *v.* City of Boston.
Twentieth Century Club *v.* City of Boston.
Episcopal Church Association *v.* City of Boston.
Jessie S. Raymond *v.* City of Boston.
William Endicott *v.* City of Boston.
Charles E. Cotting *v.* City of Boston.
Francis C. Welch *et als. v.* City of Boston.
George N. Talbot *v.* City of Boston.
Noyes Brothers, Inc., *v.* City of Boston.
Nathan L. Crooker *v.* City of Boston.
Osha Bresnick *v.* City of Boston.
Francis C. Welch *et al. v.* City of Boston.
Elizabeth Q. Bowles *v.* City of Boston.

Charles E. Cotting *et al.* *v.* City of Boston.
Charles E. Cotting *et al.* *v.* City of Boston.
Francis C. Welch *et al.* *v.* City of Boston.
Augustus Thorndike *v.* City of Boston.
Charles E. Cotting *et al.* *v.* City of Boston.
Richard Dalrymple *v.* City of Boston.
Rosalie I. Herd *v.* City of Boston.
Prov. Inst. for Savings *v.* City of Boston.
Aug. Thorndike *et al.* *v.* City of Boston.
Philip Dexter *et al.* *v.* City of Boston.
Charles E. Cotting *et al.* *v.* City of Boston.
Georgianna Pollard *v.* City of Boston.
Caroline D. Rollins *et al.* *v.* City of Boston.
Nathaniel J. Rust *v.* City of Boston.
George Willcomb *v.* City of Boston.
Mary B. Conant *v.* City of Boston.
Caroline Vorenberg *v.* City of Boston.
Eunice S. Wallace *v.* City of Boston.
Allice Carpenter *v.* City of Boston.
Horace Chenery *v.* City of Boston.
Mary H. Packard *v.* City of Boston.
Horace H. Thorndike *v.* City of Boston.
Annie I. Stanwood *v.* City of Boston.
Mary M. Strong *v.* City of Boston.
John F. Brooks *v.* City of Boston.
Lillian A. Little *v.* City of Boston.
Richard E. Traiser *v.* City of Boston.
Amy L. Coolidge *v.* City of Boston.
Frances A. Frothingham *v.* City of Boston.
Mary G. Russell *v.* City of Boston.
Margaret A. Wright *v.* City of Boston.
James S. Gill *v.* City of Boston.
Schuyler S. Bartlett *et al.* *v.* City of Boston.
Solomon Levitt *v.* City of Boston.
Francis C. Welch *et al.* *v.* City of Boston.
Francis C. Welch *et al.* *v.* City of Boston.
Francis C. Welch *et al.* *v.* City of Boston.
Lena F. Leviseur *v.* City of Boston.
George E. Homer *v.* City of Boston.
George Wigglesworth *et al.* *v.* City of Boston.
Alice G. Richardson *v.* City of Boston.
Shepard Brooks *v.* City of Boston.
Philip L. Saltonstall *et al.* *v.* City of Boston.
Mary G. Knight *v.* City of Boston.
Perkins Inst. School for the Blind *v.* City of Boston.
Warren B. P. Weeks *et al.* *v.* City of Boston.
Warren B. P. Weeks *et al.* *v.* City of Boston.
Fred A. Whitney *v.* City of Boston.
Julia A. Daly *v.* City of Boston.
Aaron Hailparn *v.* City of Boston.
Isadore Israel *v.* City of Boston.
Warren B. P. Weeks *v.* City of Boston.
Alice S. King *v.* City of Boston.
Pres't and Fellows of Harvard College *v.* City of Boston.
Flora A. Ginty *v.* City of Boston.
Peter C. Brooks *v.* City of Boston.
Elizabeth Andrew Mason *v.* City of Boston.
George R. White *v.* City of Boston.
Tarrant P. King *v.* City of Boston.
Francis Peabody *et al.* *v.* City of Boston.
Elizabeth M. Carroll *v.* City of Boston.
Mary S. Ames *v.* City of Boston.

Props. of Arlington Street Church *v.* City of Boston.
George E. Cabot *et al.*, Tr., *v.* City of Boston.
Francis C. Welch *v.* City of Boston.
Willard Dalrymple *v.* City of Boston.
Onorato Cusumano *v.* City of Boston.
Charles E. Cotting *et al.* *v.* City of Boston.
Willard Dalrymple *et al.* *v.* City of Boston.
Georgiana P. Federhen *et al.* *v.* City of Boston.
Boston Wesleyan Association *v.* City of Boston.
Warren B. P. Weeks *et al.* *v.* City of Boston.
Samuel O. Ochs *et al.* *v.* City of Boston.
Samuel P. Mandell *et al.* *v.* City of Boston.
Wm. S. Bigelow *et al.* *v.* City of Boston.
Howard Stockton *et al.* *v.* City of Boston.
William C. Endicott *et al.* *v.* City of Boston.
Francis C. Welch *et al.* *v.* City of Boston.
Charles L. Burrill *et al.* *v.* City of Boston.

All of the foregoing suits were carefully investigated by the commission. A very small percentage of them were tried. Most of those remaining have been disposed of and their settlement was passed upon and approved by the commission in every instance.

In addition to these suits, more than 375 claims for damages, varying in amount from $10,000 to $50, were made against the city of Boston, upon which suits were not brought, but each of which was investigated by the commission and such disposition made of same as the commission determined just.

Question 10.— What sums, if any, in excess of the amount bid on the contract for the different sections of subway have the commission allowed in the last five years?

Answer.— With few exceptions there is no "amount bid" on the contracts of the commission. Having in view the necessary uncertainty and the necessity for frequent changes in plan as the work progresses, all the large contracts made by the commission are based on unit prices. The contractor gives the price per cubic yard for excavation, concrete, etc., the price per linear foot for sewers and drains, the price per ton for setting up steel work, and so on through all the different kinds of work involved. This plan enables the commission to alter the quantities as it may find desirable, while the contractor is paid at the same rate per unit for the work which he actually does. Herewith is a copy of the last large contract for subway work, that for Section H of the East Boston Tunnel Extension. The canvass of these bids follows:—

Rowe Contracting Co.,	$435,755
Patrick McGovern & Co.,	415,310
James H. Fannon,	413,370
James J. Coughlan Co.,	392,180
H. Nawn Contracting Co.,	382,518
Coleman Brothers,	372,400

In order to aid the contractor in fixing the unit prices in his bid, the approximate quantities are estimated by the engineers of the commission, but these quantities are distinctly stated to be only approximate (for instance, see page 5); and the contract contains a provision that the commission may increase or diminish any of the items without change of price per unit within certain limits. This provision frequently enables the commission to effect economies.

Every large contract, in order to provide for work which may possibly be required, but which it is impossible to foresee in advance, contains an item known as "Item X" (see page 13), which is for extra work which will not come under any of the classifications of previous items. This, as shown by the specifications, is paid for at its cost plus 10 per cent. For instance, it is impossible to foresee precisely what work will be required in underpinning buildings. This can only be determined as the work progresses. Various other kinds of work which cannot be foreseen are included under this item.

In answer to the question, therefore, after the above explanation, the only sums in excess of those contemplated and provided for in the contract are the allowances made to the contractor for claims which he may make. These allowances during the last five years have been as follows: —

No. 382 C. C., P. McGovern,	$9,153 29
No. 393 C. C., Coleman Bros.	7,000 00

These allowances include the remission of amounts previously charged the contractor for space occupied in the streets and in buildings. The earlier contracts provided that the contractor should be charged for all space occupied on the streets and within buildings, in proportion to the time of occupation. This provision was made in order to protect the public against an undue occupation of space or unreasonable delays in the prosecution of the work. Upon the completion of a contract the contractor frequently asked to have these amounts remitted, and, if the engineer of the commission reported that the contractor had occupied no more space than was reasonably necessary, and had done the work as expeditiously as could reasonably be expected, the sums charged him for occupation of space were frequently remitted. Such sums remitted are included in the allowances stated above.

The recent contracts of the commission provide for charging the contractor for space occupied in buildings, but only for street occupation of *more* space than the engineer of the commission deems reasonably necessary. (See page 25 of the contract enclosed.)

Question 11.— Are there any non-competitive contracts given out, and if so, on what basis and why?

Answer.— Very few non-competitive contracts have been made by the commission, though occasionally such a contract is deemed desirable.

An instance of a strictly non-competitive contract is afforded in the construction of Section G of the East Boston Tunnel Extension, which includes the new station directly beneath the present Scollay Square station, and which necessitated shoring and supporting the present station in a manner that would be safe for the public and would allow its use without interference with the existing traffic. This section also required the underpinning of the buildings over and near this portion of the subway. This work involved a great deal of risk, and was of such a character as to require the best skilled workmanship and long experience in subway construction, and especially in the underpinning and supporting of buildings; and it was impossible to make plans for this work in advance. The commission, therefore, awarded the contract without competition to the firm of Isaac Blair & Company, Inc., on the basis of cost plus 10 per cent., the commission paying, in addition, the cost of insurance on labor employed without added percentage. This matter was referred to in the nineteenth annual report of the commission in the following words: —

> The work thus far done upon the extension of the East Boston Tunnel has been in underpinning the buildings and the present station in Scollay Square, a work of considerable difficulty. As definite plans for this work could not be prepared and estimated on economically, the work has been done by Isaac Blair & Co., Inc., under contract at actual cost plus ten per cent.

Again, in the construction of the Boylston Street Subway, Section 1, extending from the westerly entrance to Massachusetts Avenue, was awarded to the Hugh Nawn Contracting Company, whose bid, based upon the estimated quantities, was $2,160 less than the next lowest bidder. Unavoidable delays, arising from the condition of the Cab Company building at the corner of Massachusetts Avenue and Newbury Street, made it necessary to defer the construction of Section 2, extending from Massachusetts Avenue across private property to the corner of Boylston and Hereford streets. Section 3, however, extending under Boylston Street from Hereford to Exeter streets, was a straight piece of work, involving no special difficulties and no negotiations with private parties, so that the plans for this section could be rapidly completed. The contract for this section was, therefore, let before the plans had been completed for Section 2, and the work was awarded to the Hugh Nawn Contracting Company (the same contractor that was building Section 1), whose bid was $61,240, or about 15 per cent. lower than the next lowest bidder.

When the plans for Section 2 were completed and the work was ready to be let, it was apparent that as the same company was doing the work on both sides of this section, it was for the best interests of the public and for the speedy completion of the work, that the same contractor should construct Section 2. The commission, therefore, divided Section 2 into two parts and extended the contract with the Hugh Nawn Contracting Company for Section 1, to cover the construction of the westerly part of Section 2 at the same unit prices as those for Section 1, and similarly extended the contract for Section 3 with the same company to cover the easterly part of Section 2 at the same unit prices as those for Section 3. This matter was referred to in the eighteenth annual report of the commission in the following words: —

> On March 12, 1912, bids were opened for the construction of Section 1, from Kenmore Street to Massachusetts Avenue, and the contract was awarded to the Hugh Nawn Contracting Company, the lowest bidder.
>
> On May 7, bids were opened for the construction of Section 3, under Boylston Street from Hereford Street to about 230 feet east of Exeter Street, and the contract was awarded to the same contractor, the lowest bidder by about $60,000.
>
> Section 2 lies between Sections 1 and 3 and includes the Massachusetts Avenue station. After consultation with the contractor for Sections 1 and 3, it was, on June 6, voted to extend these two contracts so as to include Section 2, a portion of the station being constructed under the unit prices in the contract for Section 1 and the remainder under the unit prices for Section 3. Work has not yet begun on Section 2, but rapid progress is being made on Sections 1 and 3.

Another instance of a non-competitive contract is afforded by Section 5 of the Boylston Street Subway, located in Boylston Street between Arlington and Charles streets. This was awarded to the Hugh Nawn Contracting Company without competition, but at the same unit prices for all quantities paid to the said company for Section 4, which extends from near Exeter Street to Arlington Street; the small portion of the work which could not be covered by such unit prices, consisting of the work of making the connection with the Tremont Street Subway, was to be done by the contractor under Item X, which appears in the regular form of contract used by the commission, namely, on the basis of cost plus 10 per cent. This company had taken the contract for all the westerly sections of this subway, having been the lowest bidder in each case (except that Section 2 was not advertised, as above stated). It had been the lowest bidder for Section 4, its price (based on the estimated quantities) having been $6,350 lower than the next lowest bidder, and it was awarded the contract for Section 5 without competition at the same prices per unit as for Section 4. In the opinion of the commission, this procedure will probably result in the completion of the Boylston Street Subway to a temporary connection with the present subway, and will allow its being put into operation several months earlier than would otherwise have been possible. This action was taken subsequent to the date of the last annual report, which was for the year ending June 30,

1913. The records of the commission for the meeting of Aug. 14, 1913, contain the following vote, referring to the matter: —

Voted, That, in view of the importance of an early completion of the Boylston Street Subway to a connection with the Tremont Street Subway, as now authorized, so that its use for traffic may begin at the earliest possible date, the commission make an additional contract with the Hugh Nawn Contracting Company covering the construction of the remaining section of the Boylston Street Subway and its connection with the Tremont Street Subway as authorized by section 2, chapter 810, statutes of 1913; such work up to such point at or near the above connection, as may be fixed by the chief engineer, to be done under the same unit prices and under the same conditions as provided in Contract 453 awarded to said company under date of December 26, 1912, for the construction of section 4, Boylston Street Subway, and the balance of the work to be done at cost plus 10 per cent., the commission to pay the liability insurance; this action being conditional upon the Hugh Nawn Contracting Company agreeing to complete all the above-named work not later than May 1, 1914.

Question 12. — At whose suggestion were the entrances and exits to the Cambridge Subway on Tremont Street altered, and what were the costs of such alterations?

Answer. — These entrances and exits were altered at the suggestion of His Honor, Mayor John F. Fitzgerald. The correspondence relating to this change may be found in the eighteenth annual report of the commission, pages 3 to 5. Owners of adjoining property also objected to the entrances and exits first constructed and claimed that their property was much injured by them. As a result of the correspondence with His Honor the Mayor, and the objections of the property owners, and with the consent of the Boston Elevated Railway Company, the structures were altered at a cost of about $3,400.

Mr. David A. Ellis qualified as a member of the commission on Aug. 15, 1913, filling the vacancy caused by the death of Hon. George G. Crocker on May 26.

Respectfully submitted,

BOSTON TRANSIT COMMISSION,
GEORGE F. SWAIN,
Chairman.

APPENDIX K.

EXTENSION OF TERM OF OFFICE OF COMMISSION.

[CHAPTER 644, ACTS OF 1914.]

AN ACT

To extend the Term of Office and to define the Duties of the Members of the Boston Transit Commission.

Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same, as follows:

SECTION 1. The term of office of the members of the Boston transit commission is hereby extended for three years from the first day of July in the year nineteen hundred and fourteen.

SECTION 2. The powers, duties and compensation of said commission during said term of three years shall be the same as are specified in chapter five hundred and forty-eight of the acts of the year eighteen hundred and ninety-four and in acts in amendment thereof or in addition thereto, except as is otherwise provided herein. Any vacancy in said commission shall be filled in the manner provided in said chapter five hundred and forty-eight.

SECTION 3. This act shall take effect upon its passage.

[Approved June 8, 1914.

APPENDIX L.

The names of all the assistants in the Engineering Department who have been employed for more than one month during the last year, together with an indication of some of the work on which each has been engaged, are given below.

Assistant Engineers.

LEON N. ALBERTS,	Plans and studies, East Boston Tunnel Extension and Dorchester Tunnel.
CHARLES H. BARTLETT,	Detail work, designs for steel structures.
BION A. BOWMAN,	Designs for steel and reinforced concrete structures.
C. LEONARD BROWN,	Construction, Sections B and C, Dorchester Tunnel.
FRANCIS V. CAREY,	Plans, Boylston-street Subway.
WILBUR W. DAVIS,	Studies and estimates for miscellaneous work, tunnel to Chelsea, extension of Washington-street Tunnel, Boylston-street connections and the enlargement of Park-street Station.
G. D. EMERSON,	In charge of construction, Sections B and C, Dorchester Tunnel, estimate of cost of removing elevated structure and building subway to Sullivan Square.
ROBERT B. FARWELL,	In charge of surveys, plans and construction, East Boston Tunnel Extension.
JAMES B. FLAWS,	Plans, assisting the engineer in charge of construction, Section 1, Boylston-street Subway. Surveys and borings for Dorchester Tunnel.
JAMES T. FRAME,	Assisting the engineer in charge of construction, Sections 4 and 5, Boylston-street Subway.
AUSTIN B. HENDERSON,	Plans for detail work, Dorchester Tunnel
LEONARD B. HOWE,	Steel and concrete design, Section G, East Boston Tunnel Extension.
WILLIAM W. LEWIS,	Designs for structures and in charge of surveys and plans, Dorchester Tunnel.
ROY M. LOTHROP,	Contract and detail plans, East Boston Tunnel Extension.
LAURENCE B. MANLEY,	In charge of surveys, plans and construction, Sections 1, 2, 3, 4 and 5, Boylston-street Subway.
LAURENCE K. MARSHALL,	Line and grade work, Section 2, Boylston-street Subway.

Clarence D. Maynard,	Assisting the engineer in charge of construction, Sections H and J, East Boston Tunnel Extension.
Philip C. Nash,	Designs for structures, Boylston-street Subway, Dorchester Tunnel and East Boston Tunnel Extension.
George F. Owen,	Plans for designs and detail work, Dorchester Tunnel.
Laurence M. Pitman,	Line and grade work, Sections 4 and 5, Boylston-street Subway.
Ralph E. Rice,	Plans, Boylston-street Subway.
Barzillai A. Rich,	Designs for structures, Dorchester Tunnel.
Ernest R. Springer,	Designs for steel and reinforced concrete structures.
George H. Stearns,	In charge of designs for steel work and reinforced concrete structures.
Herbert R. Stearns,	Designs and plans, Dorchester Tunnel.
Robert K. Taylor,	Construction work, Sections B and C, Dorchester Tunnel.
Philip B. Walker,	In charge of work at stockyards at Cypher street and at Canal street, also grouting work in East Boston Tunnel.

Draftsmen.

Paul P. Bangs,	Blueprinting, etc.
Charles R. Berry,	Plans, Boylston-street Subway.
James D. Burns,	Plans, East Boston Tunnel Extension.
* Ivan A. Chisholm,	Plans, Boylston-street Subway and Dorchester Tunnel.
Charles L. Doherty,	Plans, Dorchester Tunnel.
Frederick C. Figenbaum,	Plans, Boylston-street Subway and East Boston Tunnel Extension.
Ralph A. Fisher,	Plans for steel, East Boston Tunnel Extension and Boylston-street Subway.
W. Augustine Ford,	Plans, Dorchester Tunnel.
George P. Goodman,	Drafting and photography.
Samuel C. Lyman,	Steel work, Boylston-street Subway, East Boston Tunnel Extension and Dorchester Tunnel.
Charles B. McNally,	Plans, East Boston Tunnel Extension.
Roland B. Rand,	Plans for steel details, Boylston-street Subway and East Boston Tunnel Extension.
Edmund A. Rice,	Plans, East Boston Tunnel Extension.
Chester A. Richardson,	Plans and structural designs for Dorchester Tunnel.
Frederic W. Stiles,	Boylston-street Subway.
Laurence E. Weeks,	East Boston Tunnel Extension.

---

* Left the employ of the Commission.

JOHN M. WISEMAN,	Plans for steel, Boylston-street Subway and East Boston Tunnel Extension.

Assistants, Instrumentmen.

RICHARD A. CASWELL,	Inspecting concrete mixing, Boylston-street Subway. Line and grade work, East Boston Tunnel Extension.
HENRY L. CROCKER,	Line and grade work, Sections 4 and 5, Boylston-street Subway.
LESTER S. DANIELS,	Plans, line and grade work and settlement levels, Boylston-street Subway. Line and grade work, Section H, East Boston Tunnel Extension.
HARRY R. DRAPER,	Plans for steel work, East Boston Tunnel Extension.
CHARLES H. HARRINGTON,	Line and grade work, Sections B and C, Dorchester Tunnel.
* HENRY N. HAYWARD,	Line and grade work, Section B, Dorchester Tunnel.
JOHN A. HOLBROOK,	Line and grade work, Sections B and C, Dorchester Tunnel.
ARTHUR V. LYNCH,	Line and grade work and care of work in basements, Sections B and C, Dorchester Tunnel.
RALPH C. MCPHERSON,	Line and grade work, Sections H and J, East Boston Tunnel Extension.
DANIEL G. MOSHER,	Plans for Section C, and line and grade work, Section B, Dorchester Tunnel.
JAMES H. O'CONNOR,	Force accounts and pipe changes, Sections 4 and 5, Boylston-street Subway.
CHARLES V. REYNOLDS,	Plans, Sections 4 and 5, Boylston-street Subway.
SIDNEY S. VON LOESECKE,	Plans, Section 5, Boylston-street Subway; Enlargement of Park-street Station and studies for tunnel to Chelsea, etc.
WILLIAM L. WRIGHT, JR.,	Plans for pipe changes, Boylston-street Subway. Line and grade work, Sections B and C, Dorchester Tunnel.

Assistants, Rodmen.

WILLIAM J. COCHRAN,	Line and grade work, Sections G and H, East Boston Tunnel Extension.
WILLIAM G. DOHERTY,	Line and grade work, Sections 4 and 5, Boylston-street Subway.
JOHN P. FARRELL,	Line and grade work and settlement levels, Sections H and J, East Boston Tunnel Extension.
RAYMOND H. FELLOWS,	Sections 4 and 5, Boylston-street Subway.

---

* Left the employ of the Commission.

W. ANTHONY FORD,	Plans, line and grade work, Dorchester Tunnel. Borings for Chelsea Tunnel studies.
JOHN F. A. GIBLIN,	Sections B and C, Dorchester Tunnel.
HARRY H. LYNN,	Line and grade work, Section 5, Boylston-street Subway and Section H, East Boston Tunnel Extension.
MORA L. MILLER,	Line and grade work, Sections H and J, East Boston Tunnel Extension.
JOHN P. O'KEEFE,	Line and grade work, Section G, East Boston Tunnel Extension.
* AUSTIN S. PACKARD,	Line and grade work, Section G, East Boston Tunnel Extension.
WILLIAM J. POWER, JR.,	Line and grade work, Section 2, Boylston-street Subway.
HARRY H. THORBURN,	Plans, Section 5, Boylston-street Subway and Enlargement of Park-street Station.

Inspectors.

JOSEPH E. CAHILL,	Sections H and J, East Boston Tunnel Extension, Section 4, Boylston-street Subway.
MARTIN C. CHERRY,	Section G, East Boston Tunnel Extension.
EDWIN A. DESMOND,	Section 2, Boylston-street Subway; Section H, East Boston Tunnel Extension.
FREDERICK C. H. EICHORN,	Sections 4 and 5, Boylston-street Subway.
FRANK I. GARFIELD,	Section 2, Boylston-street Subway; Section H, East Boston Tunnel Extension.
THOMAS H. KEENAN,	Grouting in Sections B and C, East Boston Tunnel.
HERBERT D. LEARY,	Section H, East Boston Tunnel Extension.
HENRY M. McBRIDE,	Section C, Dorchester Tunnel, inspecting concrete mixing.
JOHN P. McKNIGHT,	Sections 2 and 4, Boylston-street Subway.
PERCIVAL H. MOSHER,	Section B, Dorchester Tunnel.
ROBERT P. O'KEEFE,	Sections 2, 4 and 5, Boylston-street Subway.
ALFRED W. PARKER,	Inspector in charge of structural steel work.
ALFRED E. PERKINS,	Sections 2, 4 and 5, Boylston-street Subway.
JOSEPH E. REINHALTER,	Section 4, Boylston-street Subway; Sections B and C, Dorchester Tunnel.
LEO S. STONE,	Section 4, Boylston-street Subway.
WILLIAM G. TONNER,	Section J, East Boston Tunnel Extension.
JOHN F. WATERS,	Section C, Dorchester Tunnel, inspecting concrete mixing.

---

* Left the employ of the Commission.

Chemists, Testing Material, etc.

SETH M. BRYANT,	Testing Cement.
HAROLD C. DELONG,	Chemist in charge of testing cement, asphalt and other materials.

Clerical Force.

HENRY F. BARKER,	Stenographer.
WILLIAM A. BICKFORD,	Clerk and bookkeeper at Cypher-street yard.
ARTHUR B. CARTER,	Secretary to the Chief Engineer.
HARRY E. CASEY,	Stenographer.
CHARLES E. FAY,	Messenger in drafting room, blueprinting, care of plans.
JACOB L. GARBER,	Clerk at Cypher-street yard.
*__SAMUEL KLUBOCK,__	Stenographer.
FRANCIS J. KURRISS,	Clerk and stenographer.
THOMAS J. MULDOON,	Stenographer.
THOMAS J. PETTIT,	Clerk and stenographer.
JOHN E. RYAN,	Stenographer.
JOSEPH P. SHEERIN,	Clerk.
FRANK A. SMITH,	Clerk and bookkeeper at stock yards.

---

* Left the employ of the Commission.

APPENDIX M.

CANVASS OF BIDS FOR TAKING DOWN AND REMOVING ABOVE THE FOUNDATIONS ALL THE BUILDINGS NUMBERED 113 TO 157, BOTH INCLUSIVE, CAMBRIDGE STREET, 6 AND 8 CHAMBERS STREET, AND 1 AND 3 NORTH RUSSELL STREET, BOSTON. BUILDINGS TO BE REMOVED WITHIN THIRTY DAYS FROM TIME OF NOTIFICATION. JULY 1, 1913.

BIDDER.	Will take down and remove all the buildings and pay the Boston Transit Commission.	Will take down and remove all the buildings except the three story brick building numbered 141 and 143 Cambridge Street and pay the Boston Transit Commission.
Thomas A. Elston & Co., 370 Dorchester Avenue, South Boston, Mass.	$50.00	$1.00
Swift Contracting Co., 85 Devonshire Street, Boston, Mass	75.00	1.00
New England Contracting Co., Cor. Spruce and Third Streets, Chelsea, Mass.	125.00	35.00
William Perry, 25 D Street, South Boston, Mass.	200.00	50.00
Robert R. McNutt, Inc., 178 Devonshire Street, Boston, Mass.	310.00	225.00

APPENDIX N.

CANVASS OF BIDS FOR FURNISHING 40 TONS ½-INCH AND 20 TONS ⅝-INCH SQUARE, COLD-TWISTED, OPEN-HEARTH STEEL REINFORCING RODS, 36 FEET LONG, F.O.B. CARS, BOSTON. JULY 3, 1913.

BIDDER.	PRICE PER TON OF 2,000 LBS.		Total.	Remarks.
	½″	⅝″		
Carnegie Steel Co., 120 Franklin Street, Boston, Mass.....	$49.00	$48.00	$2,920.00	Immediate shipment from stock.
Leavitt-Essensa Co., 70 Kilby Street, Boston, Mass........	41.00	40.00	2,440.00	Shipment in 2 to 3 weeks.
Leavitt-Essensa Co., 70 Kilby Street, Boston, Mass........	35.60	34.60	2,116.00	Havemeyer rods. Shipment in August.
Cambria Steel Co., 101 Tremont Street, Boston, Mass.....	35.60	34.60	2,116.00	Shipment in 60 to 90 days.
F. A. Houdlette & Son, Inc., 93 Broad Street, Boston, Mass........	35.60	34.60	2,116.00	Shipment between August 1st and 10th.
Lackawanna Steel Co., 40 Central Street, Boston, Mass......	35.10	34.10	2,086.00	Shipment in September.
Jones & Laughlin Steel Co., 131 State Street, Boston, Mass.......	35.10	34.10	2,086.00	Shipment in 60 to 90 days.
William H. Perry Co., Bowdoin Street, Everett, Mass........	33.60	32.60	1,996.00	Shipment in 30 to 60 days.

APPENDIX O.

CANVASS OF BIDS FOR FURNISHING 15 TONS $\frac{5}{16}$-INCH SQUARE, PLAIN STEEL RODS 18 OR 24 FEET LONG, F.O.B. CARS BOSTON. RODS TO BE EITHER BESSEMER OR OPEN-HEARTH. JULY 3, 1913.

BIDDER.	Amount.	Remarks.
Carnegie Steel Co., 120 Franklin Street, Boston, Mass.	$57.00 855.00	Twisted bars. Immediate shipment.
William H. Perry Co., Bowdoin Street, Everett, Mass.	42.60 639.00	30 to 60 days.
F. A. Houdlette & Sons, Inc., 93 Broad Street, Boston, Mass.	41.20 618.00	Corrugated bars. Shipment in 4 weeks. For 18 tons, or 1 carload, price would be $40.60 ton.
Lackawanna Steel Co., 40 Central Street, Boston, Mass.	38.60 579.00	Shipment in September. Open-hearth.
Cambria Steel Co., 101 Tremont Street, Boston, Mass.	38.60 579.00	Shipment in 6 to 8 weeks. Bessemer.
Cambria Steel Co., 101 Tremont Street, Boston, Mass.	36.60 549.00	This price is for $\frac{3}{8}$-inch round or square Bessemer steel, offered as an alternative bid. Shipment in 3 to 4 weeks.
Jones & Laughlin Steel Co., 131 State Street, Boston, Mass.	38.60 579.00	Shipment in 60 to 90 days.

NOTE.— As time of delivery was an important factor in placing this order, 18 tons of $\frac{3}{8}$-inch round, plain, Bessemer steel rods were ordered from the Cambria Steel Co.

APPENDIX P.

CANVASS OF BIDS FOR BORINGS IN AND NEAR THE FORT POINT CHANNEL. JULY 7, 1913.

BIDDER.	Item 1. 13 to 25 borings in Fort Point Channel, assumed 60 ft. deep.	Item 2. 6 to 12 borings on land, assumed 100 ft. deep.	Total.
Giles & Clark, 30 Church Street, New York City	$0.75 per Lin. Ft. 13 Borings 585.00 25 Borings 1,125.00	$0.75 per Lin. Ft. 6 Borings 450.00 12 Borings 900.00	 $1,035.00 2,025.00
Patrick J. Healey, 705 Park Row, New York City	0.85 per Lin. Ft. 13 Borings 663.00 25 Borings 1,275.00	0.60 per Lin. Ft. 6 Borings 360.00 12 Borings 720.00	 1,023.00 1,995.00
B. F. Smith & Co., 60 Federal Street, Boston, Mass	0.53 per Lin. Ft. 13 Borings 413.40 25 Borings 795.00	0.38 per Lin. Ft. 6 Borings 228.00 12 Borings 456.00	 641.40 1,251.00
The Charles R. Gow Co., 25 Montview Street, West Roxbury, Mass	0.40 per Lin. Ft. 13 Borings 312.00 25 Borings 600.00	0.40 per Lin. Ft. 6 Borings 240.00 12 Borings 480.00	 552.00 1,080.00

APPENDIX Q.

CANVASS OF BIDS FOR BUILDING POLICE STABLE AND GARAGE, BOYLSTON STREET, BOSTON. JULY 30, 1913.

BIDDER.	Amount.	Time to complete garage.	Time to complete entire work.	Names of sub-contractors.
J. E. Locatelli Co., Inc., 46 Cornhill, Boston, Mass.	$34,722.00	Not stated.	Not stated.	Not stated.
John W. Duff, 146 Summer Street, Boston, Mass.	31,042.00	10 weeks.	15 weeks.	Iron work, G. W. & F. Smith; Roofing and Metal Work, E. Van Noorden Co.; Plastering, John W. Duff; Brickwork, John W. Duff; Foundations, John W. Duff; Painting, F. E. Cutler; Plumbing, Peabody & Donahue; Heating, Bay State Heating Co.; Electric Work, M. Keough Co.
William Crane, Amherst & Hayward Sts., Cambridge, Mass.	29,781.00	80 working days.	140 working days.	Not stated.
John F. Griffin Co., 17 Milk Street, Boston, Mass.	27,640.00	70 working days from time of receiving contract.	85 days from time of receiving contract.	Masonry, John F. Griffin Co.; Cut Granite, Sweatt & Gould; Carpentry, John Deegan; Painting, American Painting and Dec. Co.; Plumbing, P. W. Donaghue; Steel, Wilbur F. Stewart; Heating, Power Heating & Ventilating Co.; Electric Work, E. C. Lewis, Inc.
A. Varnerin Co., 101 Tremont Street, Boston, Mass.	23,266.00	Not stated.	Four months from date of contract.	Excavating and Piles, Foundations, Reinforced Concrete, Damp Proofing, Filling, Grading, Granolithic, A. Varnerin Co.; Cut Granite, Rockport Granite Co.; Structural Steel and Light Iron Work, G. W. & F. Smith Iron Co.; Carpentry and Mill Work, A. Varnerin Co.; Hardware, S. H. Davis Co.; Painting, Frank E. Cutler; Plumbing, John Manning; Electric Work, Martin Keough; Heating, Bay State Heating Co.; Roofing and Metal Work, E. Van Noorden Co.

NOTE.— $712.00 should be added to the above amounts in each case for cork floor in the stable.

APPENDIX R.

CANVASS OF BIDS FOR REPAVING WINTER STREET. AUGUST 5, 1913.

BIDDER.	1,100 sq. yds. of concrete base, 6 in. thick.	1,100 sq. yds. of bitulithic pavement.	10 sq. yds. of asphalt pavement.	Total.
James Doherty, 133 Calumet Street, Roxbury, Mass.	$1.60 1,760.00	$1.89 2,079.00	$2.00 20.00	$3,859.00
Warren Bros. Company, 59 Temple Place, Boston, Mass.	1.55 1,705.00	1.89 2,079.00	1.89 18.90	3,802.90
Boston Paving Company, 1016 Adams Street, Dorchester, Mass.	1.43 1,573.00	1.95 2,145.00	1.95 19.50	3,737.50
Coleman Brothers, 1 Marginal Street, Chelsea, Mass.	1.20 1,320.00	2.00 2,200.00	2.50 25.00	3,545.00

CANVASS OF BIDS
TO BE OF OPI
LENGTH OF '

BID

Concrete Steel Co
7 Water Street,

Corrugated Bar C
201 Devonshire
Boston, Mass

Jones & Laughlin
131 State Stree

Lackawanna Stee
40 Central Stre

Carnegie Steel Co
120 Franklin St
Boston, Mass

Cambria Steel Co
101 Tremont St
Boston, Mass

Brown-Wales Co
C, Fargo &
Boston, Mass

Brown-Wales Co
C. Fargo &
Boston, Mass

Lackawanna Stee
40 Central Stre

Cambria Steel Co
101 Tremont St

Jones & Laughlin

APPENDIX T.

CANVASS OF BIDS FOR BUILDING ABOUT 150 CUBIC YARDS OF RUBBLE MASONRY RETAINING WALLS IN THE OLD CELLARS ON THE NEW LINE OF CAMBRIDGE STREET BETWEEN CHAMBERS STREET AND NORTH RUSSELL STREET. SEPTEMBER 8, 1913.

BIDDER.	Amount.
James J. Coughlan Co., 43 Tremont Street, Boston, Mass.	$6.00 900.00
Hugh Nawn Contracting Co., 82 Savin Street, Roxbury, Mass.	6.00 900.00
The Charles R. Gow Co., 25 Montview Street, West Roxbury, Mass.	5.50 825.00
Isaac Blair & Co., Inc., 433 Harrison Avenue, Boston, Mass.	4.48 672.00
Coleman Brothers, Pearl and Marginal Streets, Chelsea, Mass.	3.90 585.00

APPENDIX V.

CANVASS OF BIDS FOR REMOVING BUILDING 161–171 CAMBRIDGE STREET, BOSTON. OCTOBER 23, 1913.

BIDDER.	Will pay the Transit Commission.
William Perry, 25 D Street, South Boston, Mass.	$225.00
Lawlor Brothers, 16 City Square, Charlestown, Mass.	300.00
The Boston House-Wrecking Co., 329 Dorchester Avenue, South Boston, Mass.	310.00
William G. Greene & Sons, 26 Hampshire Street, Cambridge, Mass.	375.00
Julius Darish, 84 E. Lenox Street, Boston, Mass.	520.00
Guiseppe Bevilacqua, 162 Cottage Street, East Boston, Mass.	525.00
Robert R. McNutt, Inc., 178 Devonshire Street, Boston, Mass.	550.00
N. E. Contracting Company, Corner Spruce and Third Streets, Chelsea, Mass.	575.00
Swift Contracting Company, 85 Devonshire Street, Boston, Mass.	760.00

APPEN

CANVASS OF BIDS FOR CONSTRUCTING SECTIO

BIDDER.	27,000 cu. yds. earth excavation open cut. a	18,000 cu. yds. earth excavation tunnel. aa	450 cu. yds. concrete masonry removed. b	1,600 sq. yds. concrete base removed. 3b	5,000 cu. yds. concrete open cut. c	7,000 cu. yds. concrete tunnel. cc
P. McGovern & Co., 65 Oliver Street, Boston, Mass.	$4.25 114,750	$5.25 94,500	$5.00 2,250	$0.75 1,200	$11.00 55,000	$11.00 77,000
Rowe Contracting Co., 1607 Commonwealth Avenue, Brighton, Mass.	4.00 108,000	5.00 90,000	6.00 2,700	1.00 1,600	10.50 52,500	11.00 77,000
Wm. J. Sheils, 43 Tremont Street, Boston, Mass.	4.00 108,000	4.75 85,500	8.00 3,600	0.50 800	10.00 50,000	11.00 77,000
Hugh Nawn Contracting Co., 82 Savin Street, Roxbury, Mass.	3.50 94,500	4.50 81,000	4.00 1,800	0.60 960	10.50 52,500	11.00 77,000
Coleman Bros., Pearl & Marginal Streets, Chelsea, Mass.	3.70 99,900	4.20 75,600	5.00 2,250	0.50 800	9.00 45,000	9.50 66,500
James J. Coughlan Co., 43 Tremont Street, Boston, Mass.	3.50 94,500	4.15 74,700	6.00 2,700	0.70 1,120	8.90 44,500	10.00 70,000

PPEN

SECTIO

7,000 cu. yds. concrete tunnel.
cc
$11.00 77,000
11.00 77,000
11.00 77,000
11.00 77,000
9.50 66,500
10.00 70,000

APPENDIX X.

Canvass of Bids for Furnishing 100 Tons Reinforcing Rods Equal in Section to ⅞-inch Square and 50 Tons Reinforcing Rods Equal in Section to ⅝-inch Square. Rods to be of Open-hearth, New Billet, Medium Steel, 36 Feet Long, Plus or Minus One Inch. December 22, 1913.

Bidder.	100 tons ⅞″ delivered at 75 Canal St., Boston.	50 tons ⅝″ F.O.B. cars Boston, via N. Y., N. H. & H. R. R.	Total.	Time of shipment.	Kind of Rod.
Cambria Steel Co., 101 Tremont Street, Boston, Mass.	$28.20 2,820.00	$28.60 1,430.00	$4,250.00	Immediate shipment, or at some future date, to suit requirements.	Plain round, square or cold-twisted.
Lackawanna Steel Co., 40 Central Street, Boston, Mass.	28.20 2,820.00	28.60 1,430.00	4,250.00	During the week of January 5th.	Square cold-twisted.
Jones & Laughlin Steel Co., 131 State Street, Boston, Mass.	28.20 2,820.00	28.60 1,430.00	4,250.00	Commence shipping at once and complete within 1 week.	Square cold-twisted or Diamond bars.
James W. Sederquist, 8 Oliver Street, Boston, Mass.	28.20 2,820.00	28.20 1,410.00	4,230.00	Ship from mill in 4 weeks or less.	Square cold-twisted.
Concrete Steel Co., 7 Water Street, Boston, Mass.	28.00 2,800.00	28.60 1,430.00	4,230.00	Within 1 week from date of receipt of order from Pennsylvania.	Square Havemeyer bars.
W. E. Clark & Co., 120 Milk Street, Boston, Mass.	28.00 2,800.00	28.40 1,420.00	4,220.00	10 days to 2 weeks from Pennsylvania.	Square cold-twisted.

APPENDIX Y.

CANVASS OF BIDS FOR FURNISHING AND DELIVERING ON BOYLSTON STREET, AT THE BOSTON PUBLIC LIBRARY, 57 PIECES OF MILFORD, MASS., PINK GRANITE FLAGGING AND FOUNDATION STONE IN ACCORDANCE WITH BOSTON TRANSIT COMMISSION PLAN 11303. JANUARY 13, 1914.

Bidder.	Amount.	Time of Delivery.
Stephen Bianchi, Board of Trade Bldg., Boston, Mass.	$2,822.00	About six weeks from date of order.
S. & R. J. Lombard, 279 Rutherford Avenue, Charlestown, Mass.	2,725.00	Thirty days after receiving plans and details.
Webb Pink Granite Co., Worcester, Mass.	2,150.00	First car to be shipped within two weeks from receipt of all necessary information and complete shipment within one month.
Austin Ford & Son, 166 Devonshire Street, Boston, Mass.	2,087.00	Commence deliveries within one week, completing in one month.

APPENDIX Z.

Canvass of Bids for Furnishing and Delivering Ribbed Terra Cotta Tile at Entrances to Stations of Boylston Street Subway, Either on Boylston Street at the Boston Public Library or on Newbury Street at the Corner of Massachusetts Avenue. January 16, 1914.

Bidder.	13,000 pieces 12″ x 12″ x 4″, scored for splitting.	2,000 pieces 6″ x 12″ x 4″, scored for splitting.	1,200 pieces partition tile, 12″ x 12″ x 4″, not scored.	800 pieces partition tile, 12″ x 12″ x 8″, not scored.	Total.	Time of delivery.
Waldo Bros., 45 Batterymarch Street, Boston, Mass.	$1,060.80	$91.60	$95.40	$111.20	$1,359.00	Could ship 6″ x 12″ x 4″ tile, scored for splitting, in 2 weeks; could ship 4″ and 8″ partition tile immediately; could ship immediately 4,000 pieces 12″ x 12″ x 4″, scored for splitting, from Cleveland, Ohio, and balance of order 2 weeks later.
National Fire Proofing Co., John Hancock Building, Boston, Mass.	910.00	70.00	81.00	96.00	1,157.00	Delivery in team-load lots from Boston stock at 24 hours' notice.
Pennsylvania Tile & Construction Co., 201 Devonshire Street, Boston, Mass.	780.00	60.00	72.00	84.00	996.00	10 days from receipt of order.

APPENDIX AA.

CANVASS OF BIDS FOR FURNISHING 8,000 TO 11,000 LINEAR FEET OF 12-INCH VITRIFIED CHANNEL PIPE AND DELIVERING ON SURFACE ON LINE OF BOYLSTON STREET SUBWAY AT MASSACHUSETTS AVENUE, AT THE BOSTON PUBLIC LIBRARY, AT BERKELEY STREET, AT KENMORE STREET, OR AT EQUALLY CONVENIENT PLACES. FEBRUARY 6, 1914.

BIDDER.	Price per Linear Foot.	Total (11,000 lin. ft.).	Time of Delivery.
David W. Lewis Company, 24 Milk Street, Boston, Mass....	$0.24	$2,640.00	200 ft. or 300 ft. could be delivered immediately from stock and the rest would come along as fast as needed.
Berry & Ferguson, 159 Devonshire Street, Boston, Mass...............	0.24 (0.192 in carload lots f.o.b. Boston, subject to Transit Commission's risk of breakage.)	2,640.00 (2,112.00 f.o.b. cars Boston.)	Cannot specify until they hear from factory.
Eastern Clay Goods Company, 141 Milk Street, Boston, Mass...	0.204	2,244.00	On orders placed in the forenoon, could make delivery the same day, or if placed in the afternoon, could make delivery the next morning.
Waldo Bros., 45 Batterymarch Street, Boston, Mass...............	0.202	2,222.00	Would be in Boston in 2 or 3 weeks' time.
Portland Stone Ware Company, 49 Federal Street, Boston, Mass..	0.198	2,178.00	1,500 ft. can be delivered immediately from stock. All would be delivered in 15 or 16 days. (In lengths of 3 ft.)
* Starrett, Fields Company, 809 Massachusetts Avenue, Boston, Mass...............	0.198	2,178.00	Delivery in 10 days. (In lengths of 2 ft.)

* Awarded.

CANVASS OF BIDS FOR
TONS STEEL REIN
H. R.R. RODS T

BIDDER
Carnegie Steel Compa 120 Franklin Street,
Jones & Laughlin Stee 131 State Street, Bc
F. A. Houdlette & So 93 Broad Street, Bc
Concrete Steel Compa 7 Water Street, Bos
Cambria Steel Compa 101 Tremont Street
Lackawanna Steel Co 40 Central Street,
Corrugated Bar Com 201 Devonshire Str
Jones & Laughlin Ste 131 State Street, B
W. E. Clark & Com 120 Milk Street, B

APPENDIX CC.

CANVASS OF BIDS FOR FURNISHING ABOUT 18 TONS OF OPEN-HEARTH STEEL ANGLES, BARS AND PLATES, F.O.B. CARS BOSTON. FEBRUARY 12, 1914.

BIDDER.	Price per Ton.	Total.	Time of Shipping.
Republic Iron & Steel Co., 17 Battery Place, New York, N. Y.	$29.20 to $38.20	Bid on only part of schedule.	
Carnegie Steel Company, 120 Franklin Street, Boston, Mass.	28.60 plus extras.		Within 2 weeks.
Jones & Laughlin Steel Co., 131 State Street, Boston, Mass.	28.60 plus ½ extras.		Within 2 to 3 weeks.
Brown-Wales Company, C, Fargo & Egmont Streets, Boston, Mass.	28.40	$511.20	Within 2 to 3 weeks.
Cambria Steel Company, 101 Tremont Street, Boston, Mass.	28.30	509.83	Within 3 to 4 weeks.
W. E. Clark & Company, 120 Milk Street, Boston, Mass.	28.10	505.80	Within 2 weeks.

APPENDIX DD.

CANVASS OF BIDS FOR CASING STRUCTURAL STEEL COLUMNS WITH CEMENT MORTAR IN BOYLSTON STREET SUBWAY. FEBRUARY 12, 1914.

BIDDER.	55 columns, platforms, Massachusetts station. (1)	4 columns, ticket office lobby, Massachusetts station. (2)	63 columns, platforms, Copley station. (3)	99 columns, between tracks, Copley station. (4)	294 columns, between tracks, Copley station to Church st. (5)	7½ cu. yds. of wall between columns. (6)	Total.
Simpson Bros. Corp., 166 Devonshire Street, Boston, Mass.	$37.73 2,075.15	$21.82 87.28	$31.62 1,992.06	$25.29 2,503.71	$30.51 8,969.94	$30.00 225.00	$15,853.14
Coleman Bros., Pearl and Marginal Streets, Chelsea, Mass.	23.00 1,265.00	20.00 80.00	18.00 1,134.00	16.00 1,584.00	15.00 4,410.00	12.00 90.00	8,563.00
Anthony Baruffaldi, 7 Parker Place, Somerville, Mass.	15.50 852.50	15.50 62.00	15.50 976.50	15.50 1,534.50	15.50 4,557.00	20.00 150.00	8,132.50
Hugh Nawn Contracting Co., 82 Savin Street, Roxbury, Mass.	15.00 825.00	15.00 60.00	15.00 945.00	15.00 1,485.00	15.00 4,410.00	15.00 112.50	7,837.50
John E. Palmer, 1016 Old South Building, Boston, Mass.	22.00 1,210.00	15.00 60.00	16.00 1,008.00	14.00 1,386.00	11.00 3,234.00	12.00 90.00	6,988.00

APPENDIX GG.

CANVASS OF BIDS FOR 100 TONS OF $\frac{5}{16}$-INCH SQUARE PLAIN STEEL BARS, 24 FEET LONG, F. O. B. CARS CYPHER STREET SIDING, BOSTON; HALF TO BE DELIVERED BEFORE MAY 1, 1914, AND REMAINDER NOT LATER THAN MAY 15, 1914. MARCH 11, 1914.

BIDDER.	Price per Ton of 2,000 Lbs.	Total.
Cambria Steel Company, 101 Tremont Street, Boston, Mass	$35.60 *	$3,560.00
Carnegie Steel Company, 120 Franklin Street, Boston, Mass	35.60	3,560.00
Republic Iron & Steel Co., 17 Battery Place, New York, N. Y.	34.60	3,460.00
Jones & Laughlin Steel Co., 131 State Street, Boston, Mass	34.60	3,460.00
Lackawanna Steel Company, 40 Central Street, Boston, Mass	34.60	3,460.00
W. E. Clark & Company, 120 Milk Street, Boston, Mass	34.45	3,445.00
Arthur C. Harvey Company, 374–394 Congress Street, Boston, Mass	34.20	3,420.00

* Same price for Slick reinforcing bar.

APPENDIX II.

CANVASS OF BIDS FOR SETTING RIBBED TILE (FURNISHED BY THE COMMISSION) IN THE MASSACHUSETTS AND COPLEY STATIONS OF THE BOYLSTON STREET SUBWAY. APRIL 14, 1914.

BIDDER.	Setting 2,800 sq. yds. of half-ribbed terra cotta, 2 inches thick, on the subway walls.	Setting 210 sq. yds. of 12″ x 12″ x 4″ terra cotta blocks, for partitions.	Setting 90 sq. yds. of 12″ x 12″ x 8″ terra cotta blocks, for partitions.	Furnishing and applying 2,000 sq. yds. of cement plaster, ¼ to ¾ inch thick, for straightening walls and partitions.	Furnishing and applying 1,000 sq. yds. of cement plaster, ¾ to 1¼ inches thick, for straightening walls and partitions.	Total.	TIME OF COMPLETION (Weeks from beginning of work). Massachusetts station.	TIME OF COMPLETION (Weeks from beginning of work). Copley station.
	(1)	(2)	(3)	(4)	(4a)			
Thomas F. Broderick, 40 Custer Street, Jamaica Plain, Mass...	$1.25 3,550.00	$0.90 189.00	$1.00 90.00	$0.51 1,020.00	$0.80 800.00	$5,599.00	4	4
Tyler Wires Company, 120 Boylston Street, Boston, Mass..........	0.71 1,988.00	0.63 132.30	0.67 60.30	0.89 1,780.00	1.61 1,610.00	5,570.60	4	4
Stephen T. Keith, 816 Old South Building, Boston, Mass..........	0.99 2,772.00	0.82 172.20	0.995 89.55	0.65 1,300.00	0.70 700.00	5,033.75	4	4
Rowe Contracting Company, 1607 Commonwealth Ave., Brighton, Mass........	0.55 1,540.00	0.41 86.10	0.70 63.00	0.90 1,800.00	1.05 1,050.00	4,539.10	3	3
Pennsylvania Tile & Construction Company, 201 Devonshire Street, Boston, Mass..........	0.78 2,184.00	0.58 121.80	0.78 70.20	0.65 1,300.00	0.70 700.00	4,376.00	5	5
Gleason & Berry, 67 Cabot Street, Roxbury, Mass........	0.45 1,260.00	0.45 94.50	0.45 40.50	0.75 1,500.00	1.45 1,450.00	4,345.00	3	3

APPENDIX JJ.

CANVASS OF BIDS FOR CONSTRUCTING ENTRANCE TO COPLEY STATION OF THE BOYLSTON STREET SUBWAY AT THE BOSTON PUBLIC LIBRARY. APRIL 23, 1914.

BIDDER.	Amount.	Time of Completion.
W. A. Snow Iron Works, Inc., 19 Portland Street, Boston, Mass..	$15,970.00	August 20, 1914.
John Williams, Inc., 556 West 27th St., New York City..	13,165.00	December 1, 1914.
Norfolk Iron Company, Norfolk Downs, Mass............	12,990.00	October 1, 1914.
Hecla-Winslow Company, Inc., 101 Park Avenue, New York City..	9,890.00	November 1, 1914.

APPENDIX KK.

CANVASS OF BIDS FOR FURNISHING AND DELIVERING F.O.B. CARS BOSTON, VIA N. Y., N. H. & H. R.R., CYPHER STREET SIDING, 60 TONS OF $\frac{5}{16}$-INCH SQUARE, PLAIN STEEL RODS, 24 FEET LONG, PLUS OR MINUS ONE INCH. STEEL TO BE EITHER BESSEMER OR OPEN-HEARTH. APRIL 25, 1914.

BIDDER.	Kind of Bar.	Amount.	Date of Shipment.
Republic Iron & Steel Co., 17 Battery Place, New York City	Square plain, open-hearth steel bars.	* $34.60 2,076.00	Ship in about 3 to 4 weeks, although this delivery is not guaranteed.
Concrete Steel Company, 7 Water Street, Boston, Mass	Havemeyer bars.	34.00 2,040.00	Commence shipment in 1 week from receipt of order at mill and complete in 4 weeks at latest.
Lackawanna Steel Company, 40 Central Street, Boston, Mass	Plain square or round bars.	33.60 2,016.00	If order is placed at once, can ship in following week.
Cambria Steel Company, 101 Tremont Street, Boston, Mass	Either Bessemer or open-hearth square plain bars.	33.60 2,016.00	If order is placed at once, can ship in following week.
Carnegie Steel Company, 120 Franklin Street, Boston, Mass	Plain square or round bars.	33.60 2,016.00	If order is placed at once, can ship in following week.
W. E. Clark & Company, 120 Milk Street, Boston, Mass	Square plain in accordance with specifications.	32.80 1,968.00	Ship in 4 weeks from receipt of order.

* One half of 1 per cent for cash in 10 days from date of invoice. Net 30 days.

CANVASS OF BIDS FOR
SECTION TO ⅝-IN
VIA. N. Y., N. H.

BIDDER
Carnegie Steel Compan 120 Franklin Street,
Arthur C. Harvey Com 374 Congress Street,
Lackawanna Steel Com 40 Central Street, Bo
Jones & Laughlin Steel 131 State Street, Bost
Cambria Steel Compan 101 Tremont Street,
Concrete Steel Compan 7 Water Street, Bosto
W. E. Clark & Compan 120 Milk Street, Bost
Jones & Laughlin Steel 131 State Street, Bost
Corrugated Bar Compa 220 Devonshire Street

APPENDIX MM.

CANVASS OF BIDS FOR FURNISHING AND PLACING 1,000 SQUARE YARDS OF WALL FINISH IN THE MASSACHUSETTS STATION OF THE BOYLSTON STREET SUBWAY. MAY 7, 1914.

BIDDER.	Furnishing and placing 670 sq. yds. of plain white terrazzo or other similar wall finish.	Furnishing and placing 150 sq. yds. of crimson terrazzo or other similar wall finish.	Furnishing and placing 110 sq. yds. of enameled ceramic mosaic tile for borders and name panels.	Furnishing and placing 100 sq. yds. of grey Portland cement plaster about 1½ inches thick for advertising panels.	Total.	Time of completion.
	(1)	(2)	(3)	(4)		
L. L. Rinaldi & Company, 263 Atlantic Avenue, Boston, Mass.	$13.50 9,045.00	$14.40 2,160.00	$17.50 1,925.00	$1.80 180.00	$13,310.00	90 days.
DePaoli Mosaic Association, 19 Damrell Street, South Boston, Mass.	5.22 3,497.40	5.22 783.00	7.02 772.20	1.62 162.00	5,214.60	4 weeks.
Stephen T. Keith, 294 Washington Street, Boston, Mass.	4.50 3,015.00	6.75 1,012.50	8.10 891.00	1.60 160.00	5,078.50	Not stated.
New England Marble Mosaic Co-operative Company, 147-155 Orleans Street, East Boston, Mass.	4.32 2,894.40	6.30 945.00	8.28 910.80	1.75 175.00	4,925.20	Not stated.
Waldo Brothers, 45 Batterymarch Street, Boston, Mass.	4.01 2,686.70	4.47 670.50	11.70 1,287.00	1.50 150.00	4,794.20	2 months.
Galassi Mosaic & Tile Co., 5 Ash Street, Boston, Mass.	4.50 3,015.00	4.50 675.00	9.00 990.00	1.00 100.00	4,780.00	8 weeks.

APPENDIX NN.

CANVASS OF BIDS FOR FURNISHING AND DELIVERING AT THE MASSACHUSETTS AND COPLEY STATIONS OF THE BOYLSTON STREET SUBWAY, 522 CASTINGS FOR BASE PLATES FOR SAFETY TREADS ON STATION STAIRWAYS. MAY 20, 1914.

BIDDER.	Amount.	Time of Delivery.
The Grecian Iron Works, 28 Tudor Street, Cambridge, Mass.	$1,755.00	Six weeks.
G. W. & F. Smith Iron Co., Gerard Street, Roxbury, Mass.	1,691.00	Six weeks.
L. E. Sanborn Co., Elkins Street, South Boston, Mass.	1,650.00	Seven weeks.
Shawmut Iron and Wire Works, 537 Rutherford Ave., Charlestown, Mass.	1,320.00	Not stated.
Gibby Foundry Co., Condor Street, East Boston, Mass.	975.00	Thirty days.

Canvass of Bids for Plas

Bidder.
Michael J. Monahan, 319 Washington Street, Boston, Mass........
Patrick Coffey, 46 Cornhill, Boston, Mass........
Muir Bros. Company, 201 Devonshire Street, Boston, Mass........
Stephen T. Keith, 294 Washington Street, Boston, Mass........
John Berry, 65 Longwood Avenue, Roxbury, Mass......
Robert Gallagher Co., 166 Devonshire Street, Boston, Mass.......

APPENDIX PP.

CANVASS OF BIDS FOR FURNISHING AND PLACING 900 SQUARE YARDS OF WALL FINISH IN THE COPLEY STATION OF THE BOYLSTON STREET SUBWAY. JUNE 2, 1914.

BIDDER.	Furnishing and placing 525 sq. yds. of plain white terrazzo or other similar wall finish. (1)	Furnishing and placing 120 sq. yds. of grey terrazzo or other similar wall finish. (2)	Furnishing and placing 125 sq. yds. of enameled ceramic mosaic tile for borders and name panels. (3)	Furnishing and placing 140 sq. yds. of grey Portland cement plaster about 1½ inches thick for advertising panels. (4)	Total.	Time of Completion.
L. L. Rinaldi & Company, 263 Atlantic Avenue, Boston, Mass.	$9.00 4,725.00	$9.00 1,080.00	$11.50 1,437.50	$1.22 1,708.00	$7,413.30	13 weeks.
DePaoli Mosaic Association, 19 Damrell Street, South Boston, Mass.	5.22 2,740.50	5.22 626.40	7.02 877.50	1.62 226.80	4,471.20	4 weeks.
New England Marble Mosaic Co-operative Company, 147–155 Orleans Street, East Boston, Mass.	4.00 2,100.00	4.25 510.00	8.50 1,062.50	1.50 210.00	3,882.50	6 weeks.
Galassi Mosaic & Tile Co., 5 Ash Street, Boston, Mass.	4.00 2,100.00	4.00 480.00	9.00 1,125.00	1.00 140.00	3,845.00	8 weeks.
Stephen T. Keith, 294 Washington Street, Boston, Mass.	3.90 2,047.50	3.90 468.00	8.00 1,000.00	1.00 140.00	3,655.50	6 weeks.
Waldo Brothers, 45 Batterymarch Street, Boston, Mass.	3.80 1,995.00	3.80 456.00	7.50 937.50	.90 126.00	3,514.50	6 weeks.

APPENDIX SS.

CANVASS OF BIDS FOR FURNISHING THE MATERIALS FOR AND LAYING 10,000 SQUARE YARDS, MORE OR LESS, OF EITHER ASPHALT, BITULITHIC OR WOOD BLOCK PAVEMENT ON BOYLSTON STREET, BETWEEN EXETER AND ARLINGTON STREETS. JUNE 16, 1914.

BIDDER.	Asphalt.	Bitulithic.	Wood Block.	Concrete Base.	Total with Asphalt.	Total with Bitulithic.	Total with Wood Block.	Time of Completion.
Rowe Contracting Co., Chestnut Hill Avenue, Brighton, Mass.	No bid	No Bid	$2.75 24,750.00	$0.95 9,500.00			$34,250.00	Not stated.
J. H. Fannon, 28 Hinckley Street, Somerville, Mass.	$1.92 19,200.00	$1.95 19,500.00	2.40 21,600.00	1.10 11,000.00	$30,200.00	$30,500.00	32,600.00	Nov. 1, 1914.
J. F. Beatty, 66 Warren Street, Brighton, Mass.	1.95 19,500.00	1.95 19,500.00	2.45 22,050.00	0.83 8,300.00	27,800.00	27,800.00	30,350.00	30 days.
James Doherty, 133 Calumet Street, Roxbury, Mass.	1.90 19,000.00	1.92 19,200.00	2.42 21,780.00	0.81 8,100.00	27,100.00	27,300.00	29,880.00	10 weeks.
Coleman Brothers, Pearl and Marginal Streets, Chelsea, Mass.	2.00 20,000.00	2.00 20,000.00	2.33 20,970.00	0.80 8,000.00	28,000.00	28,000.00	*28,970.00	35 days.
Warren Bros. Co., 59 Temple Place, Boston, Mass.	1.87 18,700.00	1.90 19,000.00	No bid	0.80 8,000.00	26,700.00	*27,000.00		August 15, 1914.
Central Construction Co., 6 Beacon Street, Boston, Mass.	1.80 18,000.00	No bid	2.75 24,750.00	0.83 8,300.00	*26,300.00		33,050.00	35 working days.

Wood block paving was used and contract awarded to Coleman Bros.

* Lowest.

APPENDIX TT.

CANVASS OF BIDS FOR CONSTRUCTING A CONCRETE BALUSTRADE AND PARAPET AROUND THE OPEN INCLINE OF THE BOYLSTON STREET SUBWAY IN BOYLSTON STREET NEAR CHURCH STREET. JUNE 23, 1914.

(Reinforcing bars to be furnished by Boston Transit Commission.)

BIDDER.	Amount.	Time of Completion.
Emerson & Norris Company, 163 North Beacon Street, Brighton, Mass.	$7,173.00 6,773.00	40 days. 55 days.
Forbes L. McKenzie, 7 Water Street, Boston, Mass...........	4,850.00	9 weeks.
Simpson Bros. Corporation, 166 Devonshire Street, Boston, Mass.....	3,855.00	5 weeks.

APPENDIX UU.

CANVASS OF BIDS FOR CONSTRUCTING A CONCRETE COPING, BALUSTRADE AND PARAPET AROUND THE OPEN INCLINE OF THE EAST BOSTON TUNNEL EXTENSION IN CAMBRIDGE STREET, NEAR NORTH RUSSELL AND CHAMBERS STREETS, BOSTON. JUNE 30, 1914.

BIDDER.	Amount.	Time of Completion.
Emerson & Norris Co., 163 North Beacon Street, Brighton, Mass...........	$4,796.00	Five weeks after receipt of contract and complete drawings.
Simpson Bros. Corp., 166 Devonshire Street, Boston, Mass.............	4,515.00	Seven weeks.
Coleman Bros., Pearl and Marginal Streets, Chelsea, Mass............	2,995.00	Five weeks.

This book should be returned to the Library on or before the last date stamped below.

A fine of five cents a day is incurred by retaining it beyond the specified time.

Please return promptly.

54435-03

~~MAR 27 1931~~

JAN 31 1978

~~APR - 1 1931~~

~~DUE JAN~~

JAN 31 1978

JAN 6 1978

CANCELLED

02 Dec 77

OFCR LOAN

~~DUE MAY 24 '39~~

~~DUE JAN 13 '44~~

~~DUE MAR 21 '44~~

~~DUE MAY 20 '46~~

F

~~DUE NOV 7 '46~~

3 2044 103 130 142